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Summary

A test of a small three-bladed model rotor, with geometry typical of that used on tilt-rotor aircraft, was conducted in the U.S. Army Aeroflightdynamics Directorate's anechoic hover chamber. The objectives of the test were to determine the hover performance of the rotor and investigate the pressure distributions on a blade operating at various collective pitch angles and tip speeds. This report presents the rotor performance data and blade surface pressures.

Nomenclature

c	rotor chord length, in.
C_p	blade surface pressure coefficient, $(p - p_\infty)/0.5\rho(\Omega r)^2$
C_Q	rotor torque coefficient, $Q/\rho(\Omega R)^2(\pi R^3)$
C_T	rotor thrust coefficient, $T/\rho(\Omega R)^2(\pi R^2)$
FM	rotor figure of merit, $(C_T)^{1.5}/C_Q\sqrt{2}$
l	airfoil lower surface
P	blade surface pressure, lb/ft ²
P_∞	ambient pressure, lb/ft ²
Q	rotor torque, ft-lb
r	blade radial station, ft
R	rotor radius, 2 ft
rpm	rotor rotation speed, rev/min
t/c	maximum thickness to chord ratio
T	rotor thrust, lb
u	airfoil upper surface
x	chordwise distance from leading edge, in.
y	coordinate normal to blade chord, in.
β	blade twist relative to 0.75R, deg

θ_c	collective angle at 0.75R, deg
ρ	air density, slugs/ft ³
σ	thrust-weighted solidity, 0.1194
Ω	rotor rotational speed, rad/sec

Introduction

The accurate prediction of hover performance is particularly important for tilt-rotor aircraft since the payload represents about thirty percent of the aircraft's gross weight. NASA Ames Research Center has recently conducted a series of tests to measure tilt-rotor hover performance and wake geometry at various test conditions (refs. 1 and 2). Reference 3 reported the correlation of these test results with predictions using a rotorcraft analysis program, CAMRAD. They found that the theory underpredicted the XV-15 ATB (advanced technology blade) rotor hover figure of merit at high thrust coefficients ($C_T/\sigma > 0.14$). In addition, the measured figure of merit remained a high level at high thrust coefficients while the predicted value dropped off.

The purpose of this test was to obtain a blade surface pressure and performance data set which could be used to investigate the reason for the discrepancy between the measured and predicted performance of highly twisted rotors. This report presents the performance and pressure data obtained from this test but does not attempt to draw any conclusions. However, the reader may consult a paper by Tung and Branum (ref. 4), which speculates on the cause of the underprediction of the high thrust theoretical figure of merit.

This work represents the contributions of many excellent people. We would like to extend our thanks to Bill Harper, Brad Wick, and Marty Maisel who were instrumental in initiating our studies. Special thanks are due to Andy Morse who assisted us through the whole test and to Frank Caradonna for his suggestions.

Description

Rotor

The rotor tested is a small three-bladed rotor designed to operate at thrust coefficients typical of current tilt-rotor aircraft but does not represent any particular full scale configuration. The rotor was mounted on the Aeroflight-dynamics Directorate's rotary wing test stand in the Army hover chamber as shown in figure 1. The rotor system has a diameter of 4 feet and a thrust-weighted solidity of 0.1194. The blades are constructed of birch wood and have a total twist of 32° between the root cutout and the tip. The blade thickness tapers nonlinearly from the root to the tip. Given in table 1 are the twist, chord, and maximum thickness distributions of the blade as a function of radius. The blade section airfoils were originally intended to represent NACA 64 series airfoils, but templates made of 12 radial locations along the hand crafted blade showed that the actual airfoil sections differed from that series. These templates were digitized so that the actual airfoil geometry could be determined for subsequent analysis. The actual airfoil coordinates are included in appendix A. To obtain surface pressure data for this test, one of the blades was configured with nineteen 0.03 inch diameter pressure tubes. Ten of these tubes were embedded radially along the upper surface of the blade while the remaining tubes were embedded radially along the lower surface. Tap orifices were located at eight radial locations on each pressure tube. Table 2 shows the tap location for both the chordwise and radial directions. Figure 2 shows a partial view of the pressure orifices on the upper surface of the blade.

Instrumentation

Each of the nineteen pressure tubes in the blade was connected to a Kulite (YQC-250 series) differential pressure transducer using flexible plastic tubing. These pressure transducers were located inside a container above the rotor hub (fig. 2). As shown in the figure the transducers were set close to the center of rotation, 1.5 inches, and aligned vertically so that effects on the pressure measurements, caused by the centrifugal force acting on the transducer diaphragms, would be reduced as much as possible. Calibration checks of each transducer were performed on a daily basis prior to operating the rotor. This was accomplished by comparing each transducer's measured pressure to a known pressure applied at each tap orifice using a Paroscientific pressure calibrator. Thrust and torque data were obtained from the rotor using a six component strain gage balance. Other measurements included ambient temperature and pressure and rotor rpm.

To avoid being influenced by the rotor wake, the ambient pressure sensor was located directly outside of the testing chamber. Pressure data from the rotating system were transmitted to the nonrotating system using a 156 channel Polyscientific slipring. From that point, both pressure and balance data were passed through Pacific differential amplifiers and filtered to 10 Hz. All data were then recorded using an HP 3852A data acquisition system.

Test Conditions and Procedures

Performance and pressure data were obtained at collective pitch angles ranging from 0° to 28° and rotor speeds of 400, 600, 800, 1200, 1800, and 2400 rpm. Table 3 lists the collective angles and rotor speeds tested. The collective pitch angles were manually set at the hub for each blade using a template at the $3/4$ radius and a digital protractor. Pressure data were collected at one radial location at a time since each pressure tube had eight radial tap orifices per transducer. This was accomplished by sealing off seven radial locations using strips of two inch wide cellophane tape wrapped chordwise around the blade, thereby leaving just the one remaining radial location open for data measurement. Once data were obtained for that particular collective setting and radial location, another radial location was opened and the previous one sealed off. This was done until data at all eight radial locations were recorded for a range of rpm's. The collective angle was then changed and the process repeated. A check for vacuum leaks was performed each time a new radial location was sealed by using a Paroscientific pressure calibrator.

Test Results

Hover Performance Data

The tip speed of 377 ft/sec at 1800 rpm corresponds to a tip Reynolds number of about 500,000. Figure 3 shows the effect of collective pitch angle on CT/σ at 1800 rpm. The solid line indicates two different rates of increasing CT/σ with respect to the collective pitch angles. The CQ/σ as a function of collective pitch angle is given in figure 4. The solid line in this figure represents a third-order polynomial least-squares curve fit of the data. The CQ/σ versus $(CT/\sigma)^{1.5}$ curve is shown in figure 5. A linear relation is observed for $(CT/\sigma)^{1.5}$ up to 0.087 with a second linear relationship being seen above that value. The figure of merit for this rotor is shown in figure 6 as a function of CT/σ . The figure of merit reaches a plateau at 0.75 between CT/σ equal to 0.1 and 0.17 and drops off quickly as the CT/σ is increased above that level.

Pressure Data

The column of air inside the pressure tube is subjected to centrifugal force, so the measured pressure coefficients need to be corrected for this effect. This correction was applied during data reduction. The flexible tubing between the pressure tube at the 85 percent chord location on the upper surface of the blade and its transducer was not functional during the early part of the test but was repaired later in the test. Because of this, some of the figures and data tables do not contain pressure information for that location. In addition, pressure data from the 60 percent chord location on the lower surface of the blade were not obtained due to an inoperable transducer. Typical sectional pressure distributions are shown in figure 7 for all collective angles tested at 1800 rpm. Figures 8(a) and 8(b) are plots of C_p distributions over a range of collective angles at $r/R = 0.2$ and $r/R = 0.75$, respectively. The surface pressure distributions over a range of rotor speeds are shown in figures 9(a) and 9(b), respectively. From observation, the pressure coefficients do not change very much with the rotor speed. All pressure and performance data can be found in appendix B. Data are organized in order of increasing collective

angles. Multiple asterisks in the data set represent data which were not available due to problems with that particular transducer.

References

1. Felker, F. F.; Young, L. A.; and Signor, D. B.: Performance and Loads Data from a Hover Test of a Full-Scale Advanced Technology XV-15 Rotor. NASA TM-86854, Jan. 1986.
2. Felker, F. F.; Young, L. A.; Signor, D. B.; and Betzina, M. D.: Performance and Loads Data from a Hover Test of a 0.658-Scale V-22 Rotor and Wing. NASA TM-89419, Apr. 1987.
3. Felker, F. F.; Maisel, M. D.; and Betzina, M. D.: Full Scale Tilt Rotor Hover Performance. J. Am. Helicopter Soc., vol. 31, no. 2, Apr. 1986.
4. Tung, C.; and Branum, L.: Model Tilt-Rotor Hover Performance and Surface Pressure Measurement. Presented at the 46th Annual Forum of the American Helicopter Society, May 1990.

Table 1. Blade characteristics

r/R	β , deg	c , in	t/c
0.155	26.70	4.09	0.466
0.206	23.20	4.05	0.407
0.306	17.80	4.02	0.335
0.405	11.10	3.90	0.269
0.506	8.20	3.77	0.211
0.606	3.80	3.60	0.191
0.707	2.20	3.39	0.162
0.756	0.00	3.25	0.147
0.805	-0.80	3.09	0.138
0.856	-2.60	2.95	0.125
0.906	-3.90	2.78	0.120
0.959	-4.60	2.54	0.107

Table 2. Tap locations for the upper (U) and lower (L) surfaces of the pressure blade

$\%c$	6.0	10.0	15.0	25.0	30.0	35.0	40.0	45.0	50.0
$\%R$									
12.5	U	L	U,L	U	L	U	L	U	L
20.0	U	L	U,L	U	L	U	L	U	L
30.0	U	L	U,L	U	L	U	L	U	L
40.0	U	L	U,L	U	L	U	L	U	L
50.0	U	L	U,L	U	L	U	L	U	L
60.0	U	L	U,L	U	L	U	L	U	L
70.0	U	L	U,L	U	L	U	L	U	L
75.0	U	L	U,L	U	L	U	L	U	L

$\%c$	55.0	60.0	65.0	70.0	75.0	80.0	85.0	90.0	95.0
$\%R$									
12.5	U	L	U	L	U	L	U	L	U
20.0	U	L	U	L	U	L	U	L	U
30.0	U	L	U	L	U	L	U	L	U
40.0	U	L	U	L	U	L	U	L	U
50.0	U	L	U	L	U	L	U	L	U
60.0	U	L	U	L	U	L	U	L	U
70.0	U	L	U	L	U	L	U	L	U
75.0	U	L	U	L	U	L	U	L	U

Table 3. Summary of test conditions

θ_c	0	4	8	12	16	18	20	22	25	26	27	28
rpm												
400
600
800
1200
1800
2400	.	.	.									

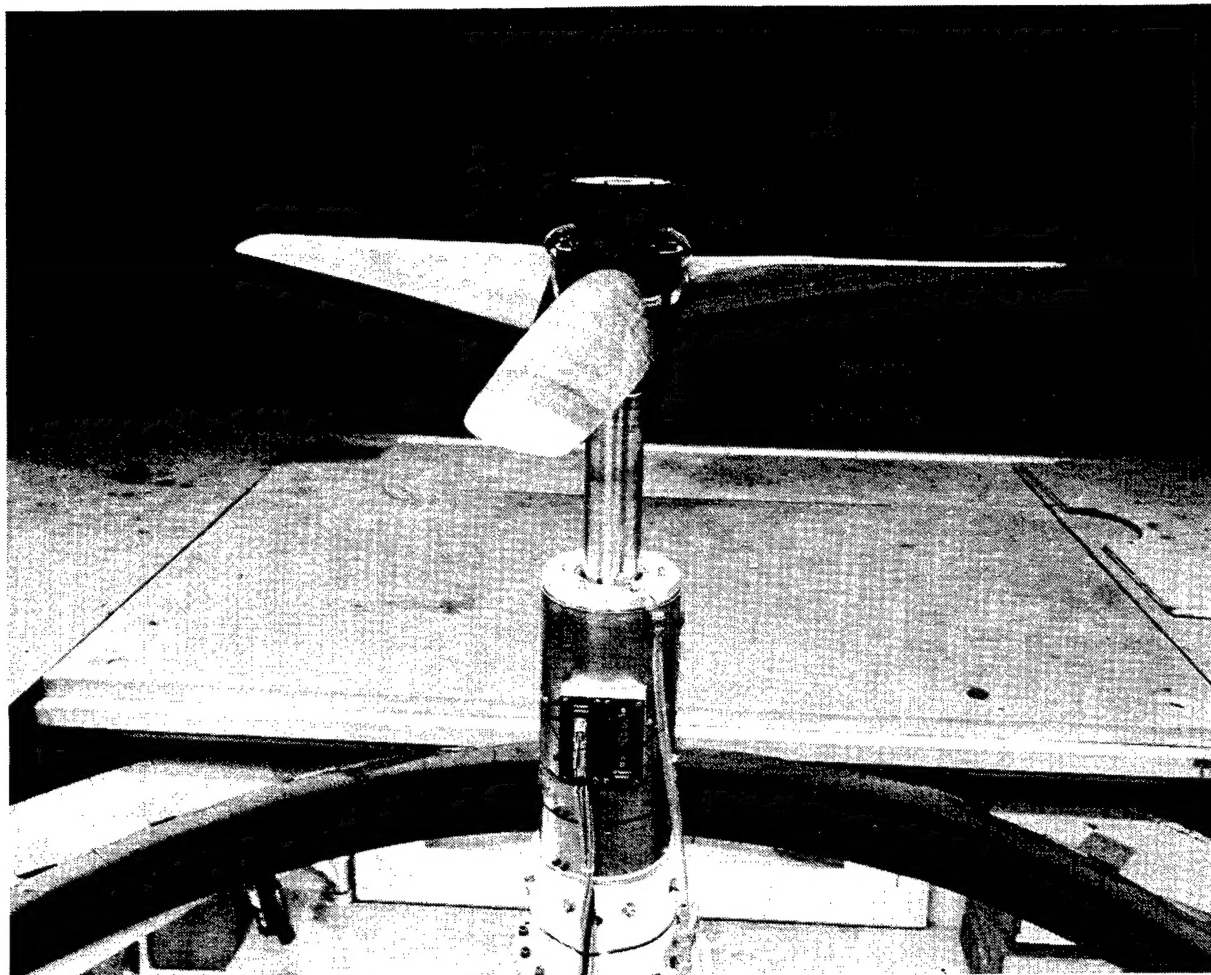


Figure 1. Three-bladed model rotor in the Army anechoic hover chamber.

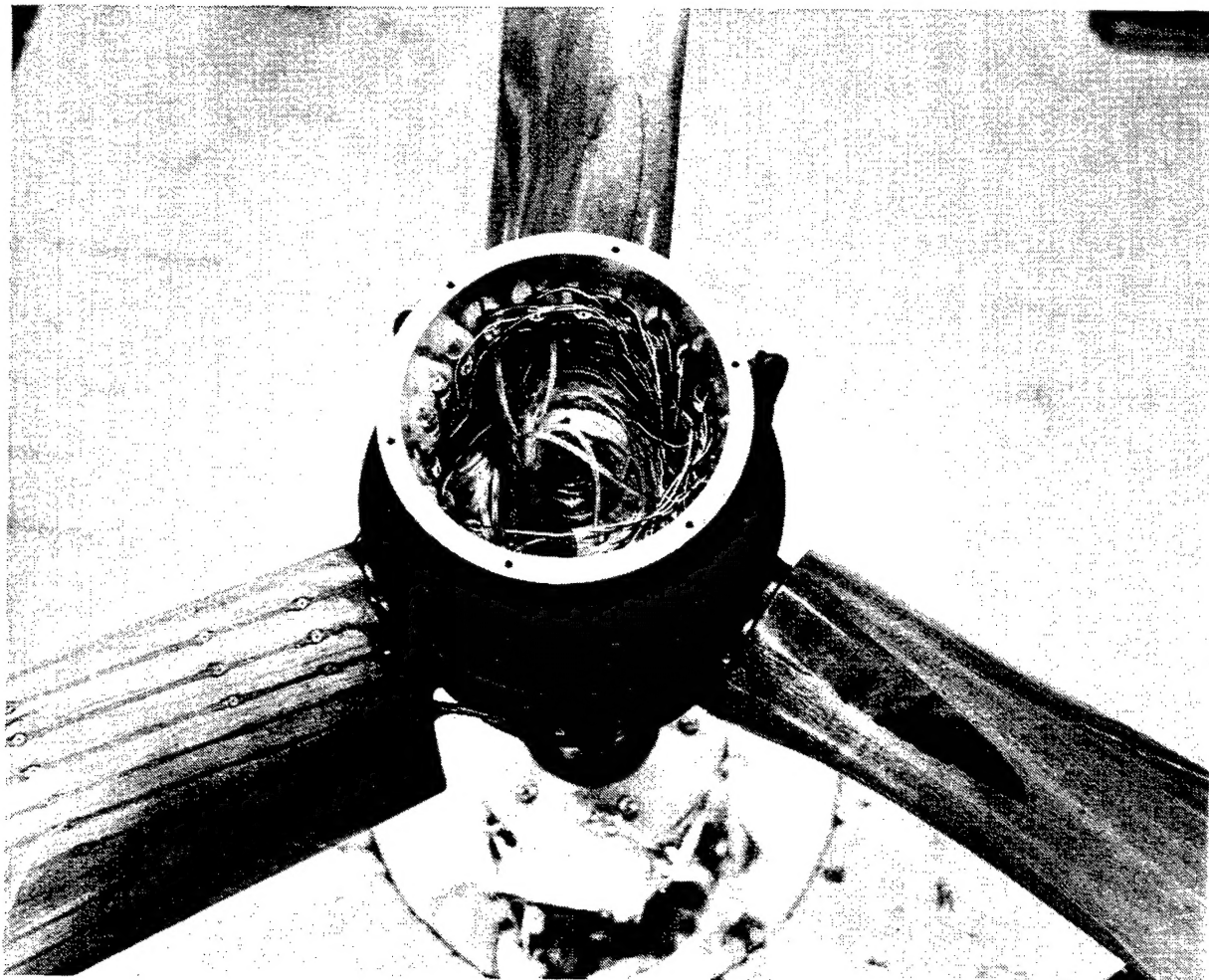


Figure 2. Top view of the model rotor showing the pressure transducers and a partial view of the pressure blade.

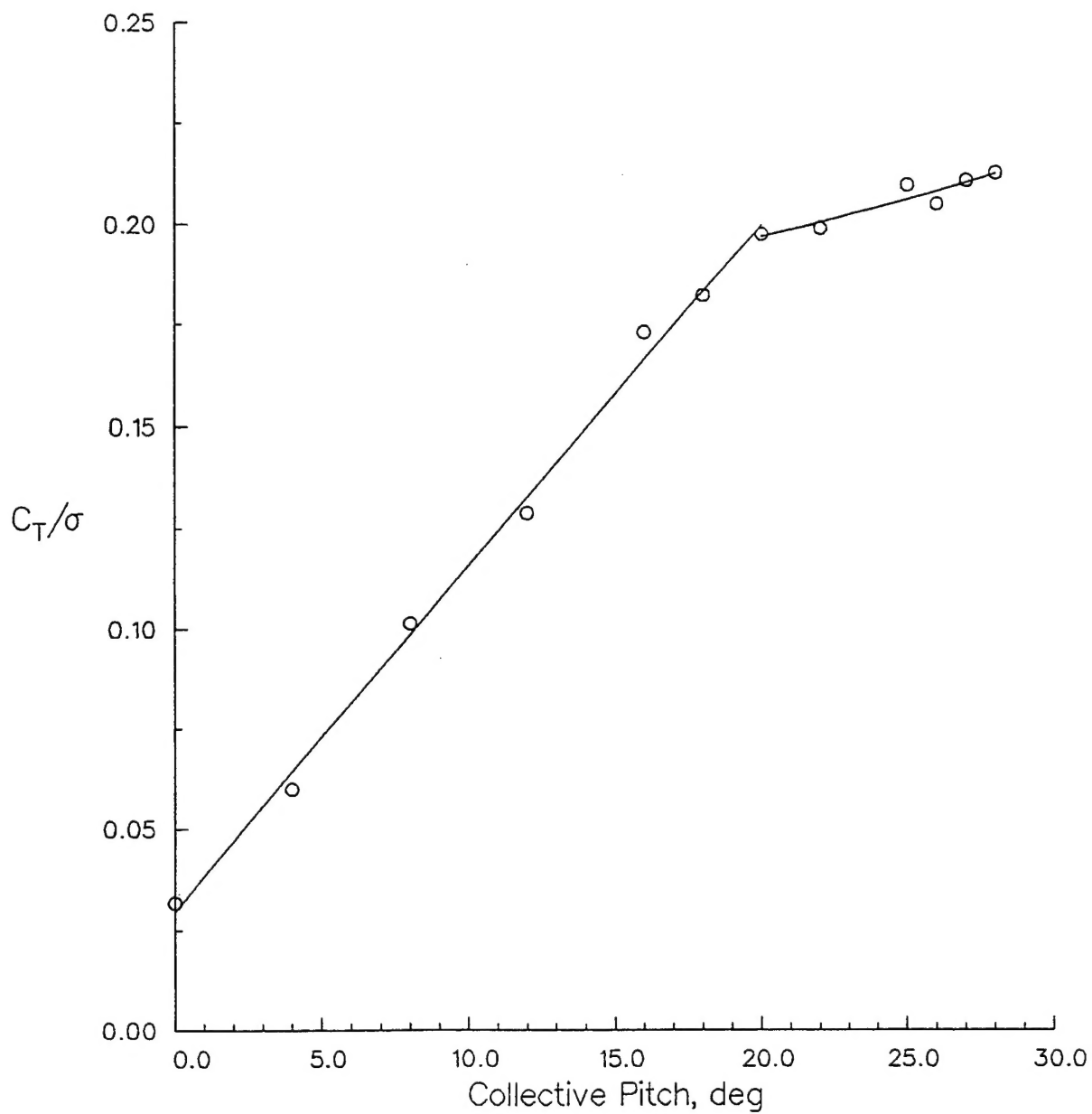


Figure 3. Effect of collective pitch on C_T / σ at 1800 rpm.

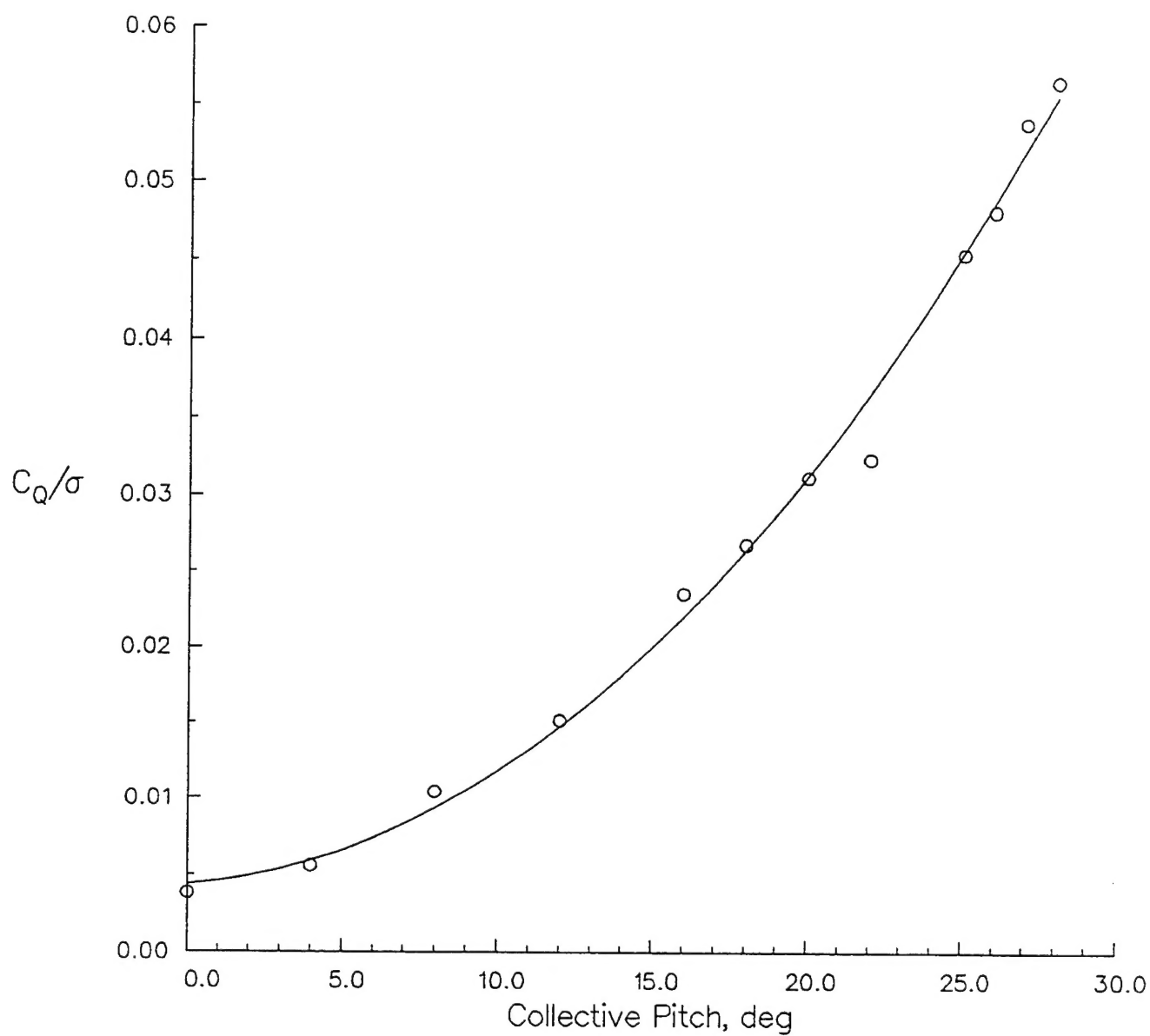


Figure 4. Effect of collective pitch on C_Q/σ at 1800 rpm.

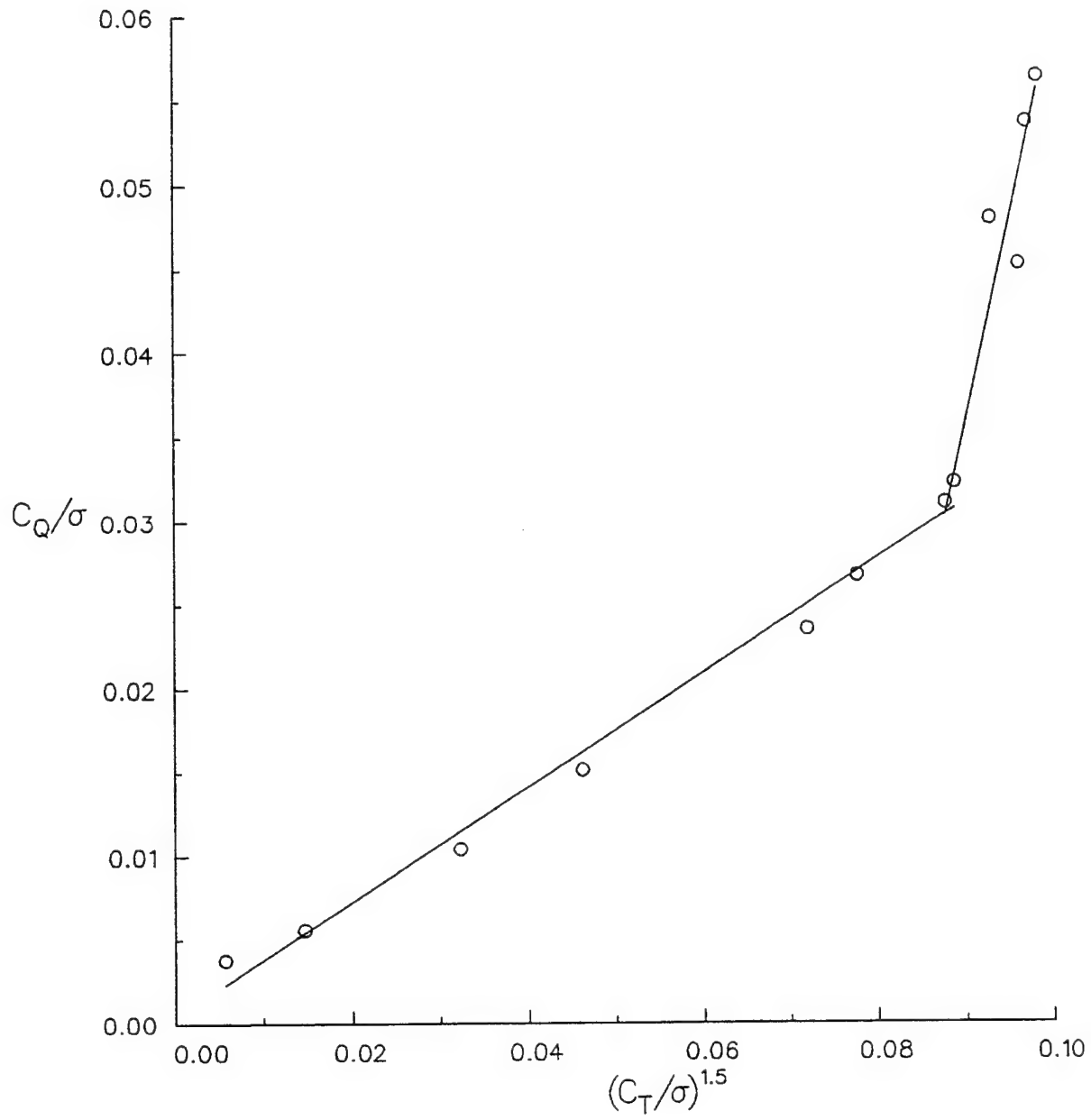


Figure 5. C_Q/σ as a function of $(C_T/\sigma)^{1.5}$ at 1800 rpm.

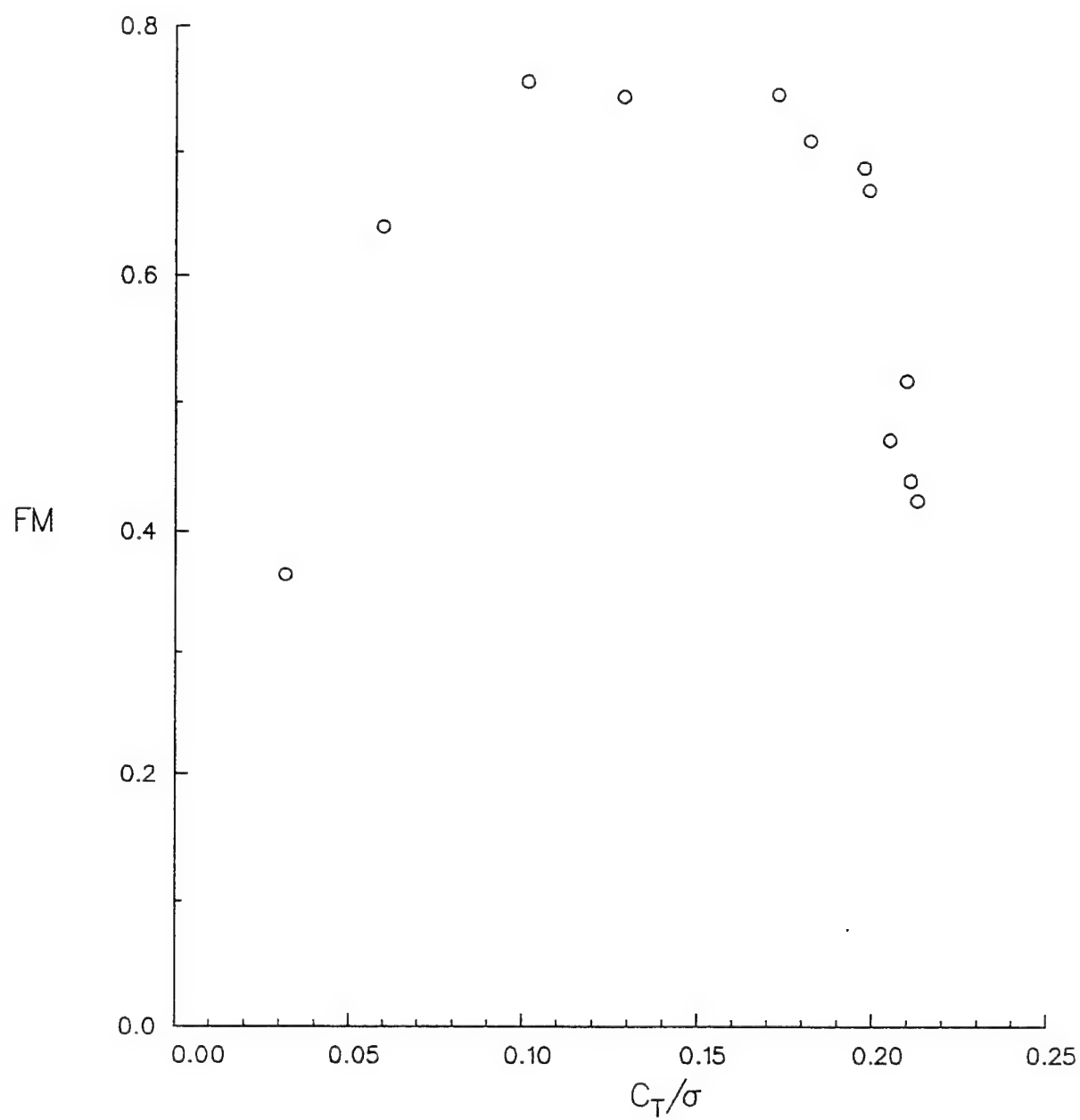


Figure 6. Effect of C_T/σ on rotor performance at 1800 rpm.

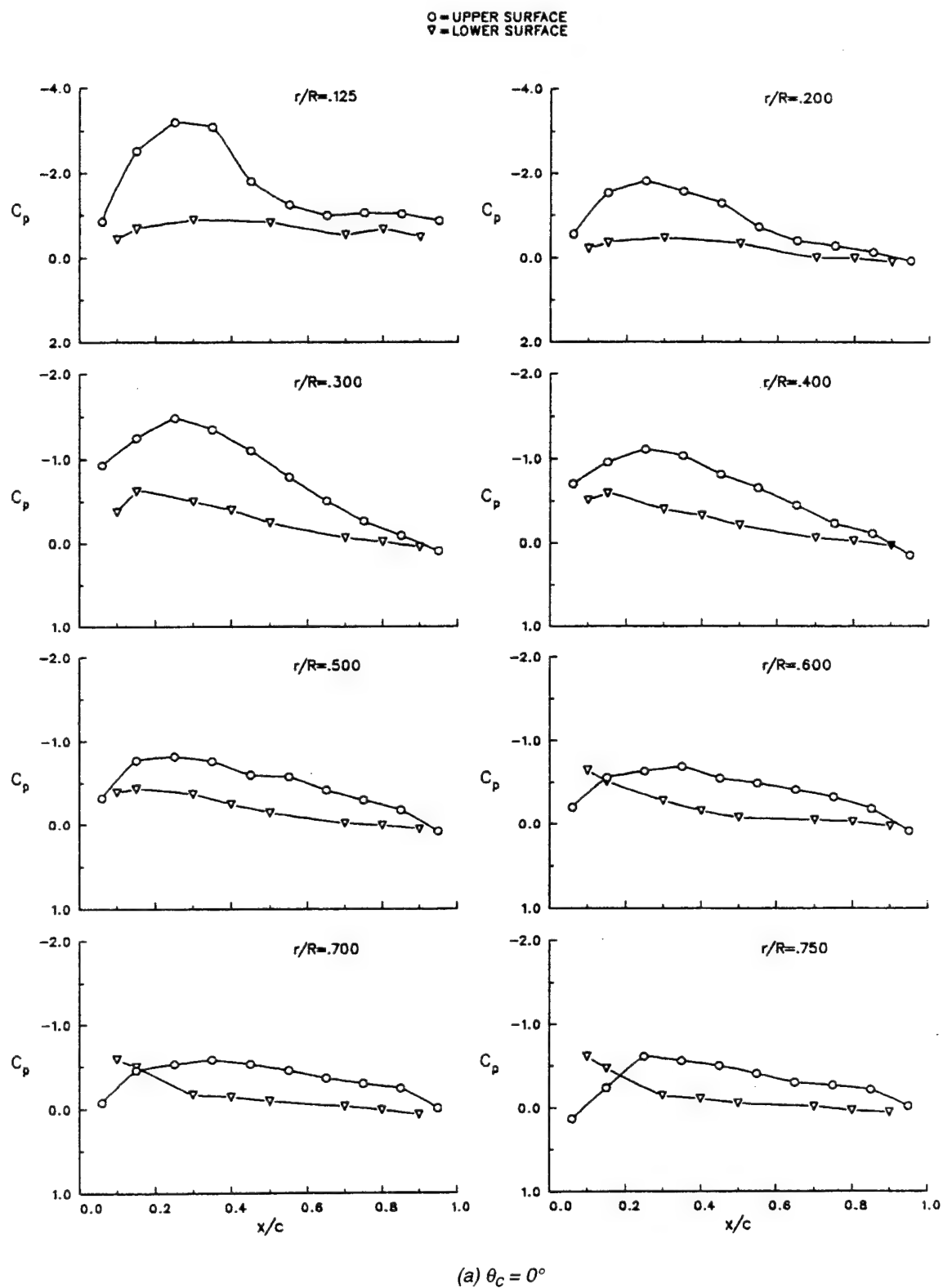
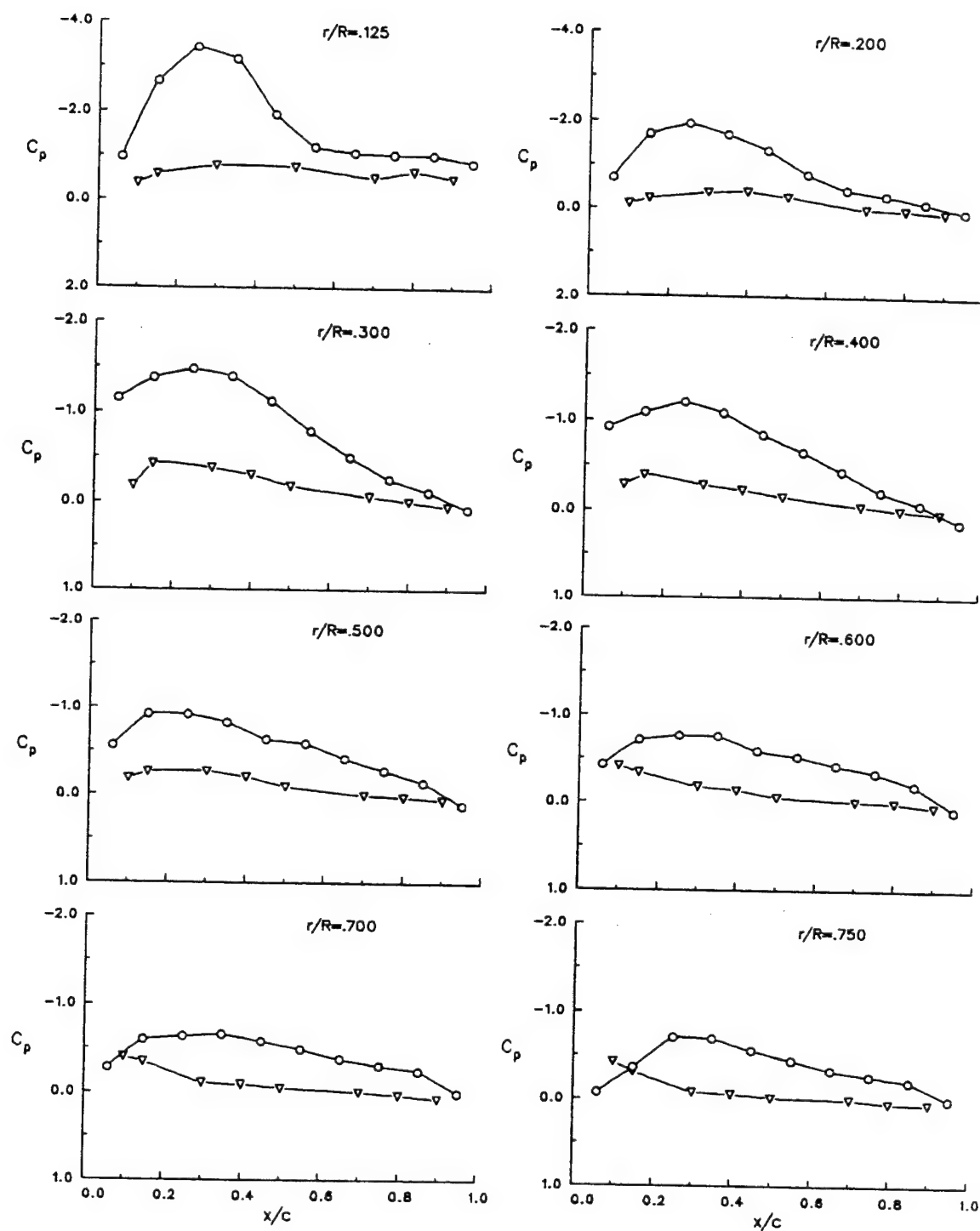


Figure 7. Chordwise pressure distributions along the blade radius; rpm = 1800. (Vertical scale changes from plot to plot.)

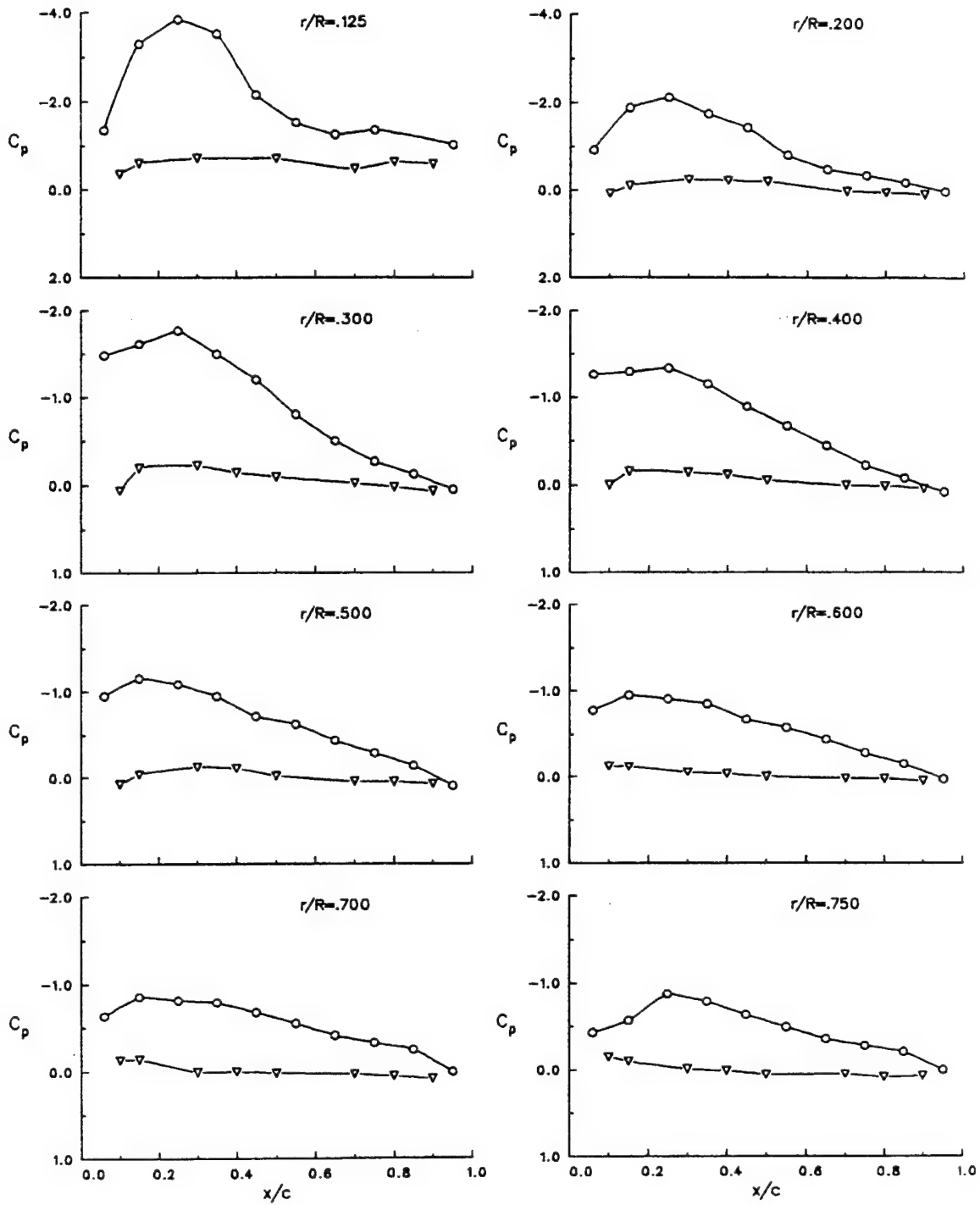
O = UPPER SURFACE
 ▽ = LOWER SURFACE



(b) $\theta_c = 4^\circ$

Figure 7. Continued.

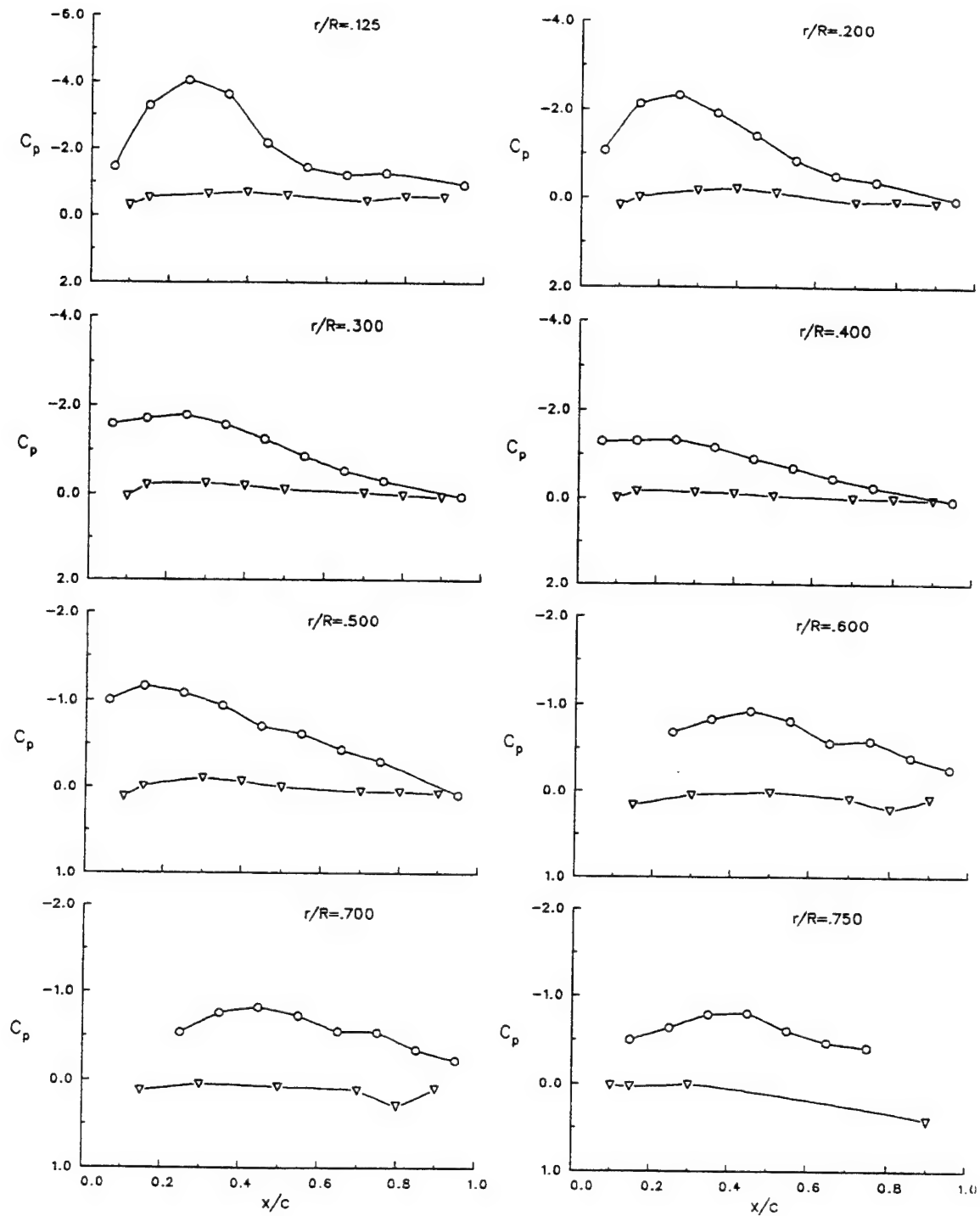
○ = UPPER SURFACE
 ▼ = LOWER SURFACE



(c) $\theta_c = 8^\circ$

Figure 7. Continued.

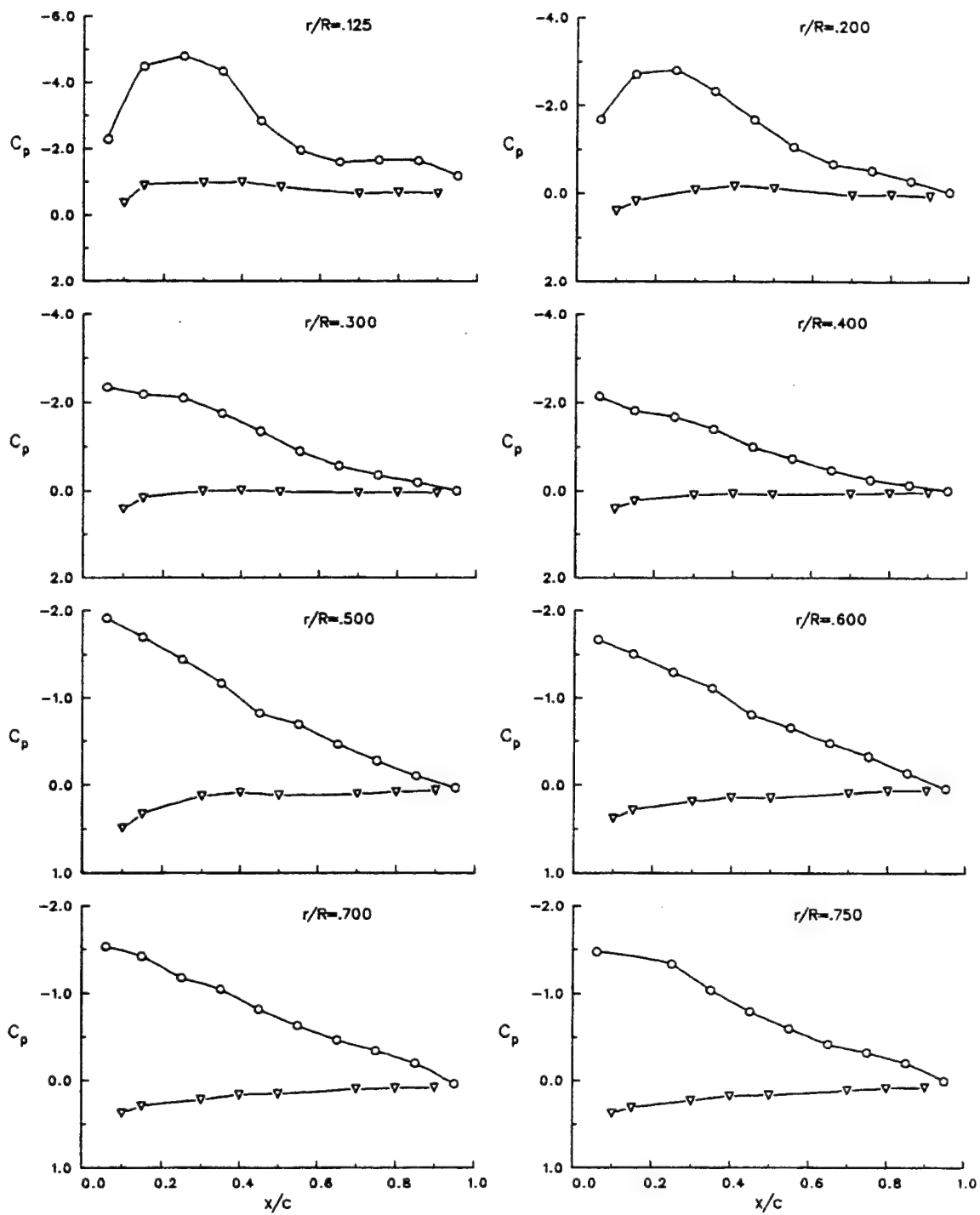
○ = UPPER SURFACE
▽ = LOWER SURFACE



(d) $\theta_c = 12^\circ$

Figure 7. Continued.

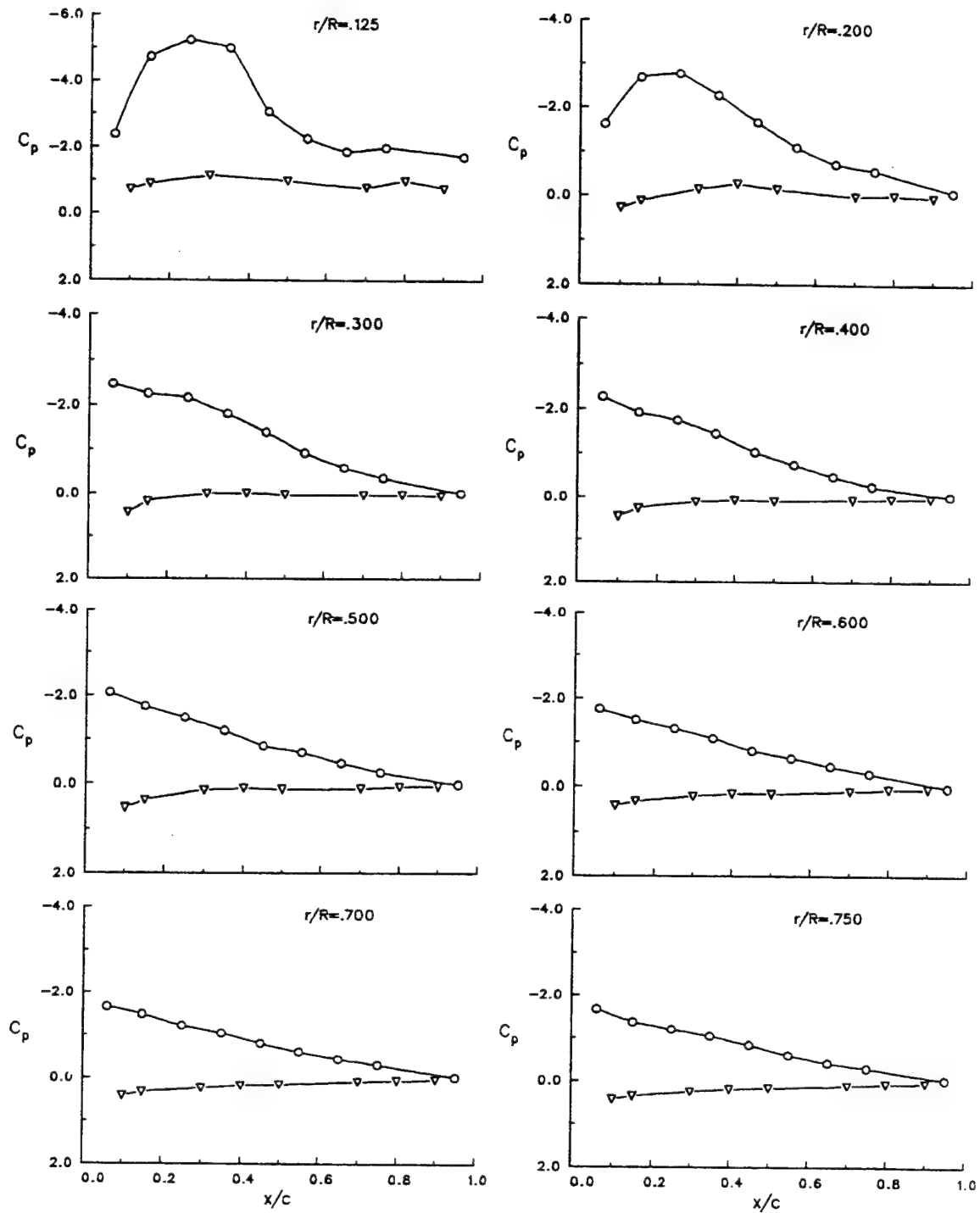
○ = UPPER SURFACE
▽ = LOWER SURFACE



(e) $\theta_c = 16^\circ$

Figure 7. Continued.

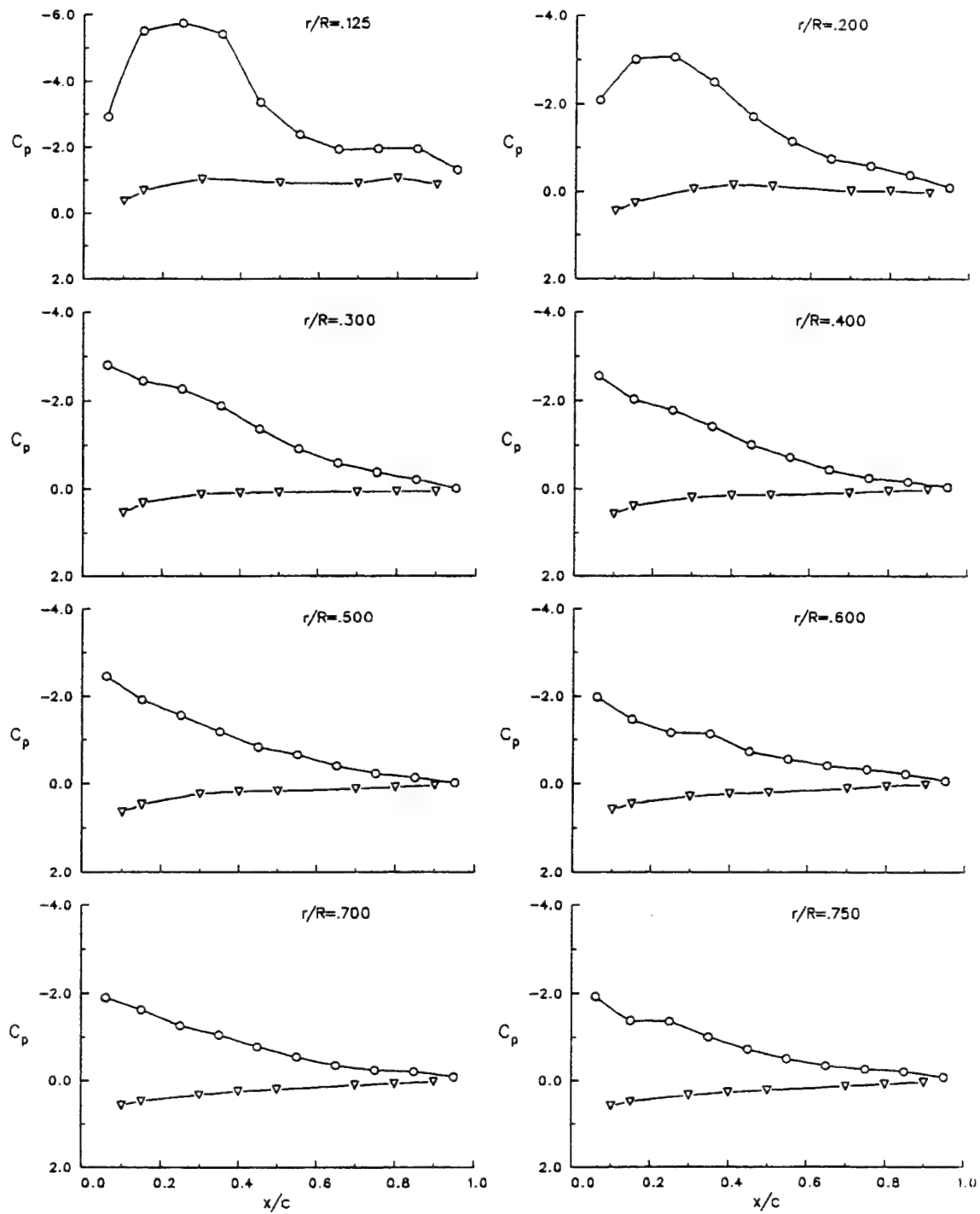
○ = UPPER SURFACE
▽ = LOWER SURFACE



(f) $\theta_c = 18^\circ$

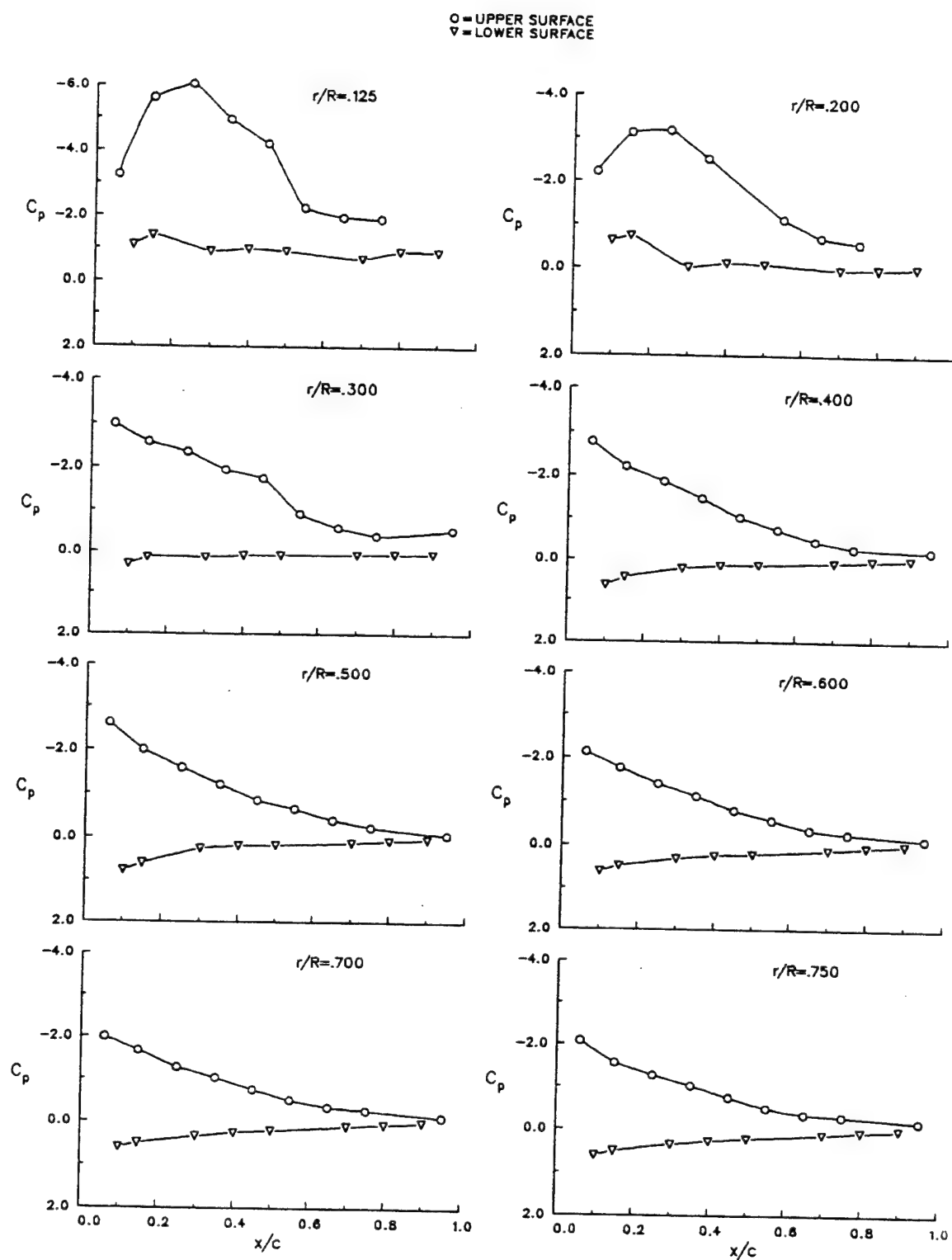
Figure 7. Continued.

○ = UPPER SURFACE
▽ = LOWER SURFACE



(g) $\theta_c = 20^\circ$

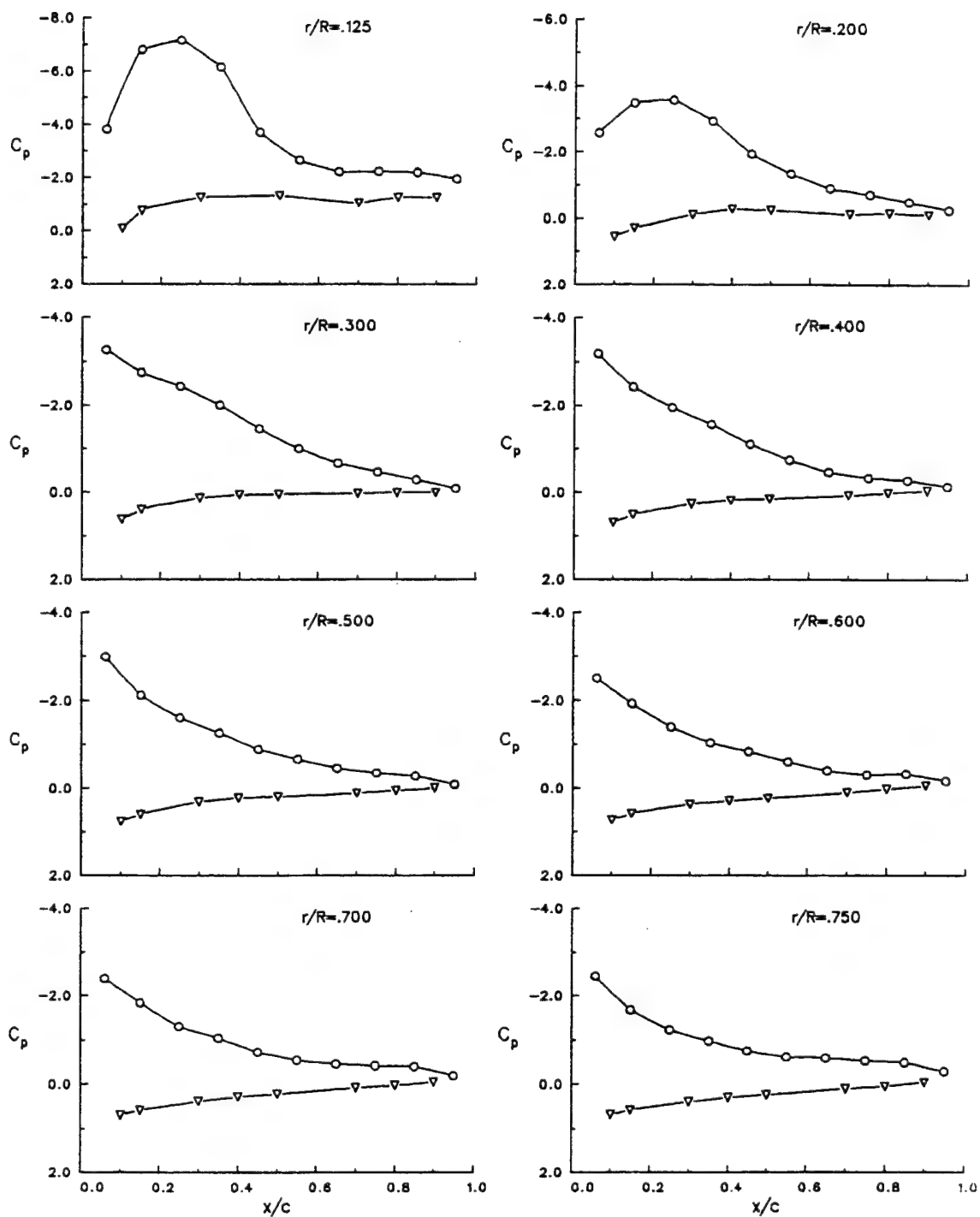
Figure 7. Continued.



(h) $\theta_c = 22^\circ$

Figure 7. Continued.

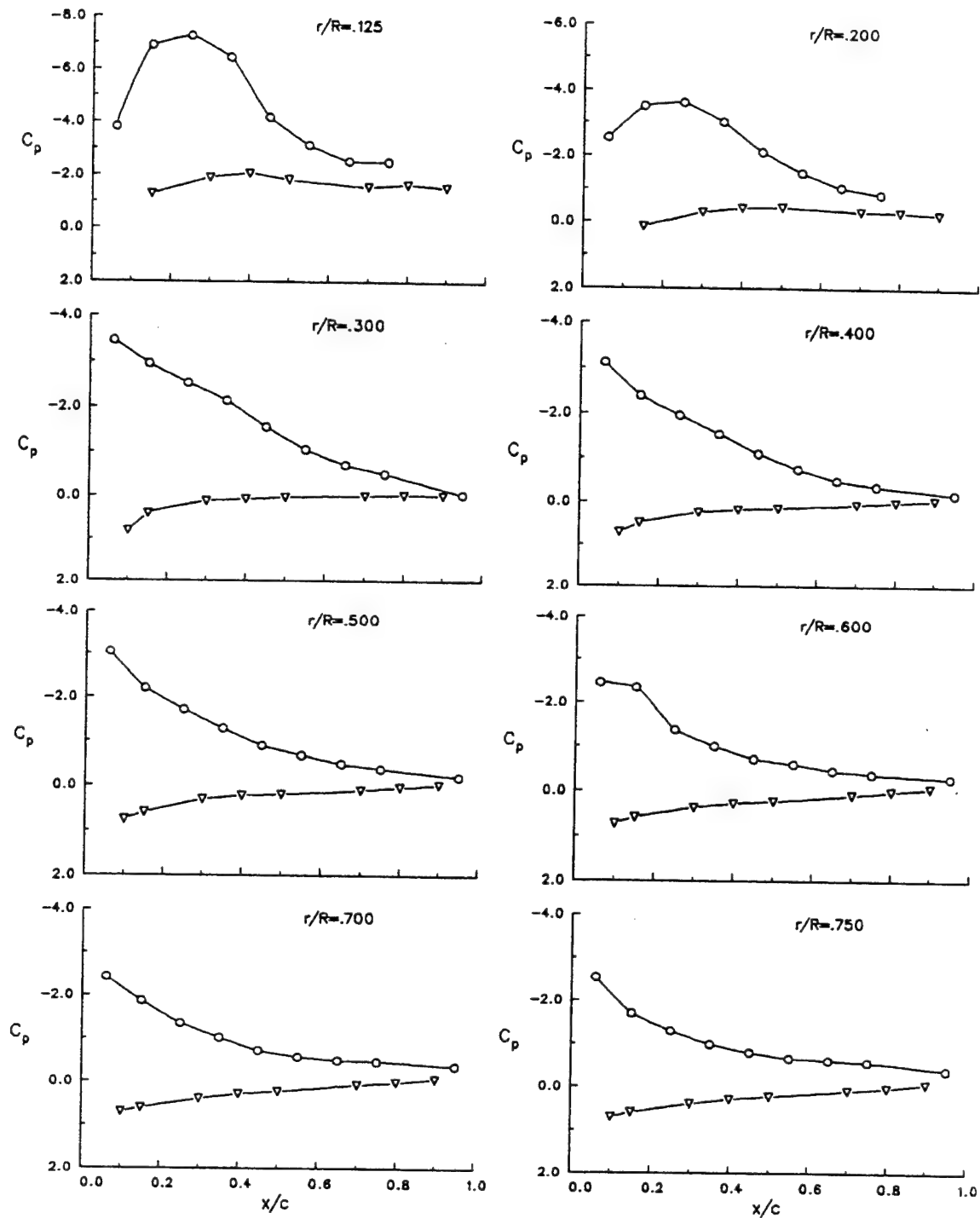
○ = UPPER SURFACE
▽ = LOWER SURFACE



(i) $\theta_c = 25^\circ$

Figure 7. Continued.

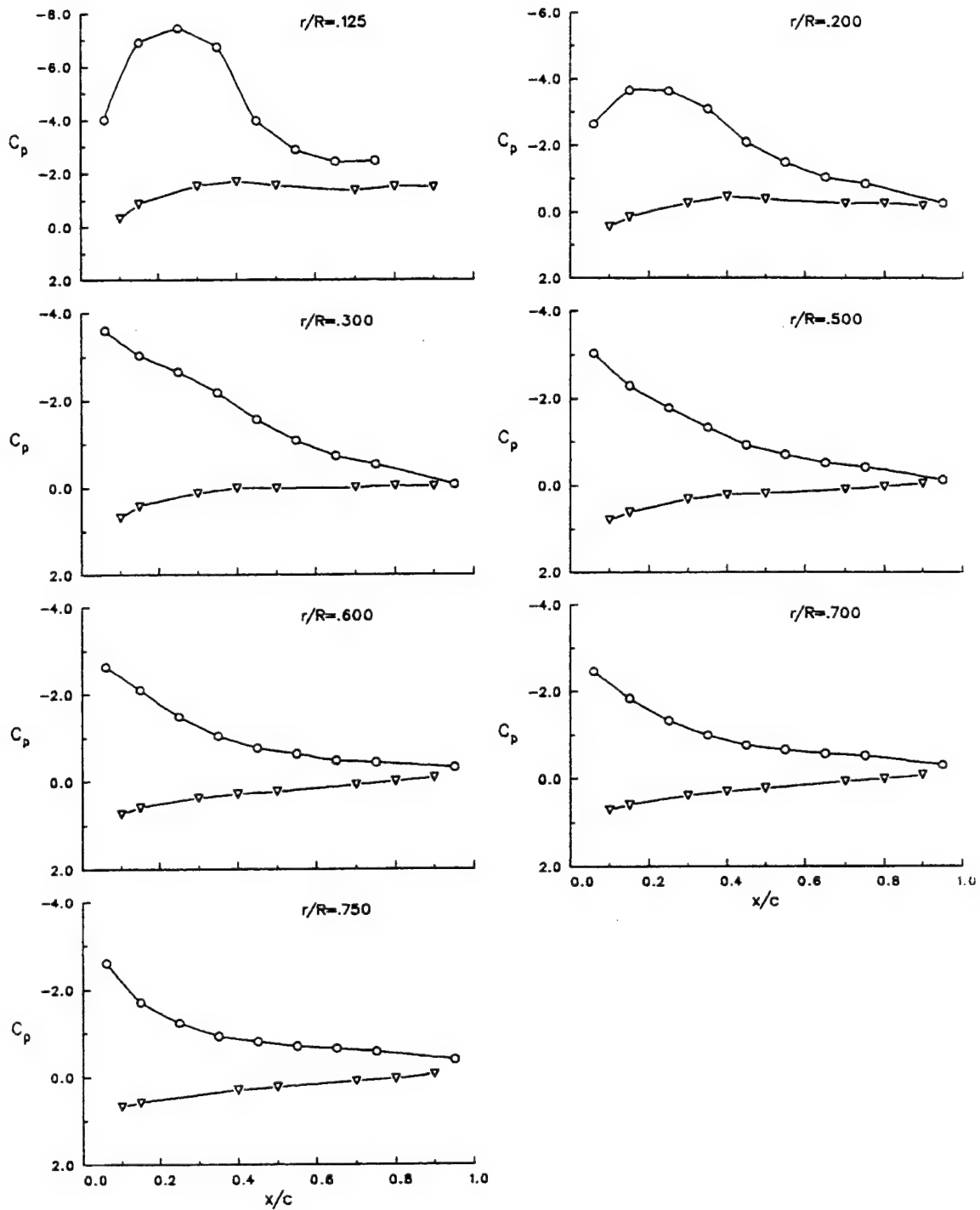
○ = UPPER SURFACE
▽ = LOWER SURFACE



(i) $\theta_c = 26^\circ$

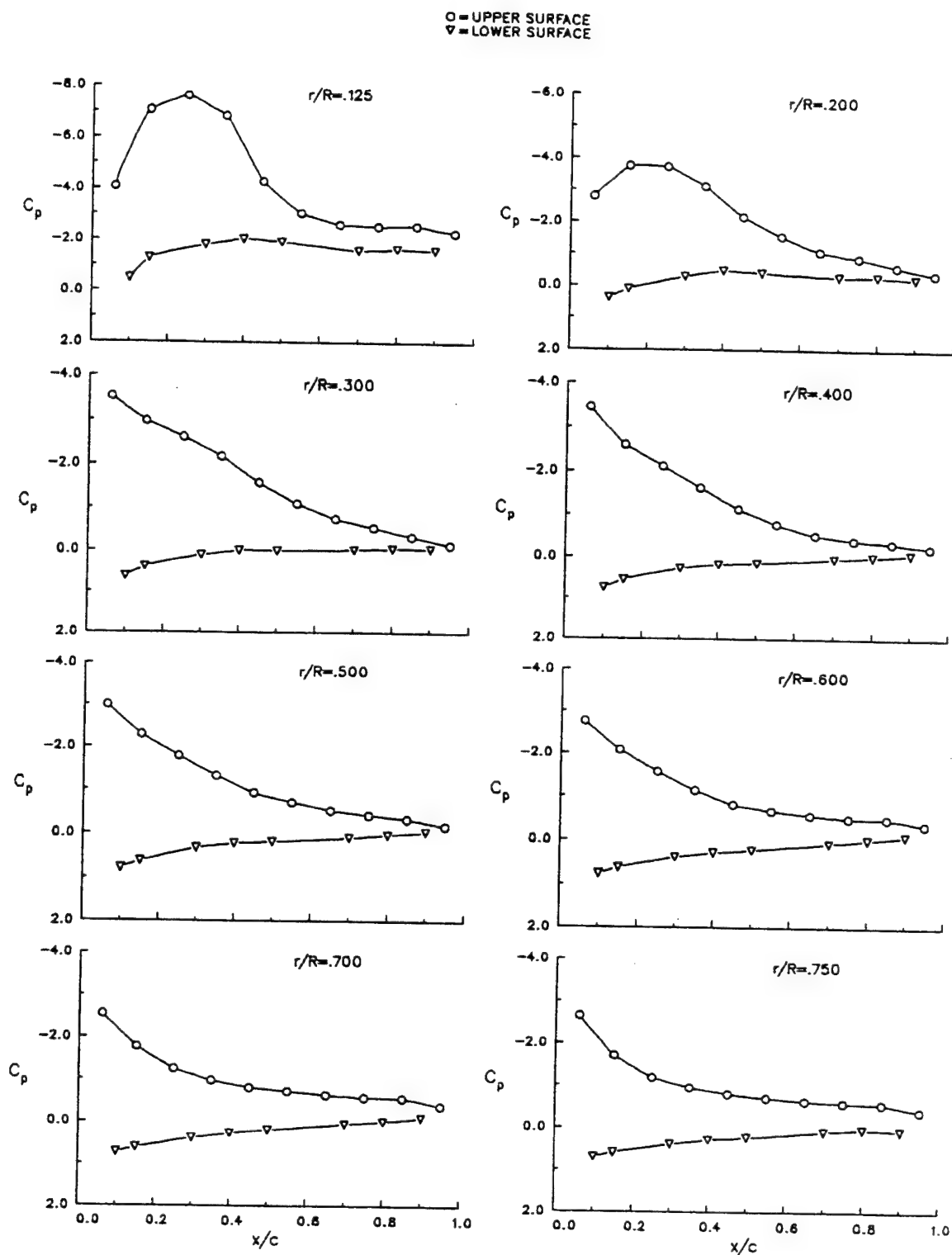
Figure 7. Continued.

○ = UPPER SURFACE
 ▼ = LOWER SURFACE



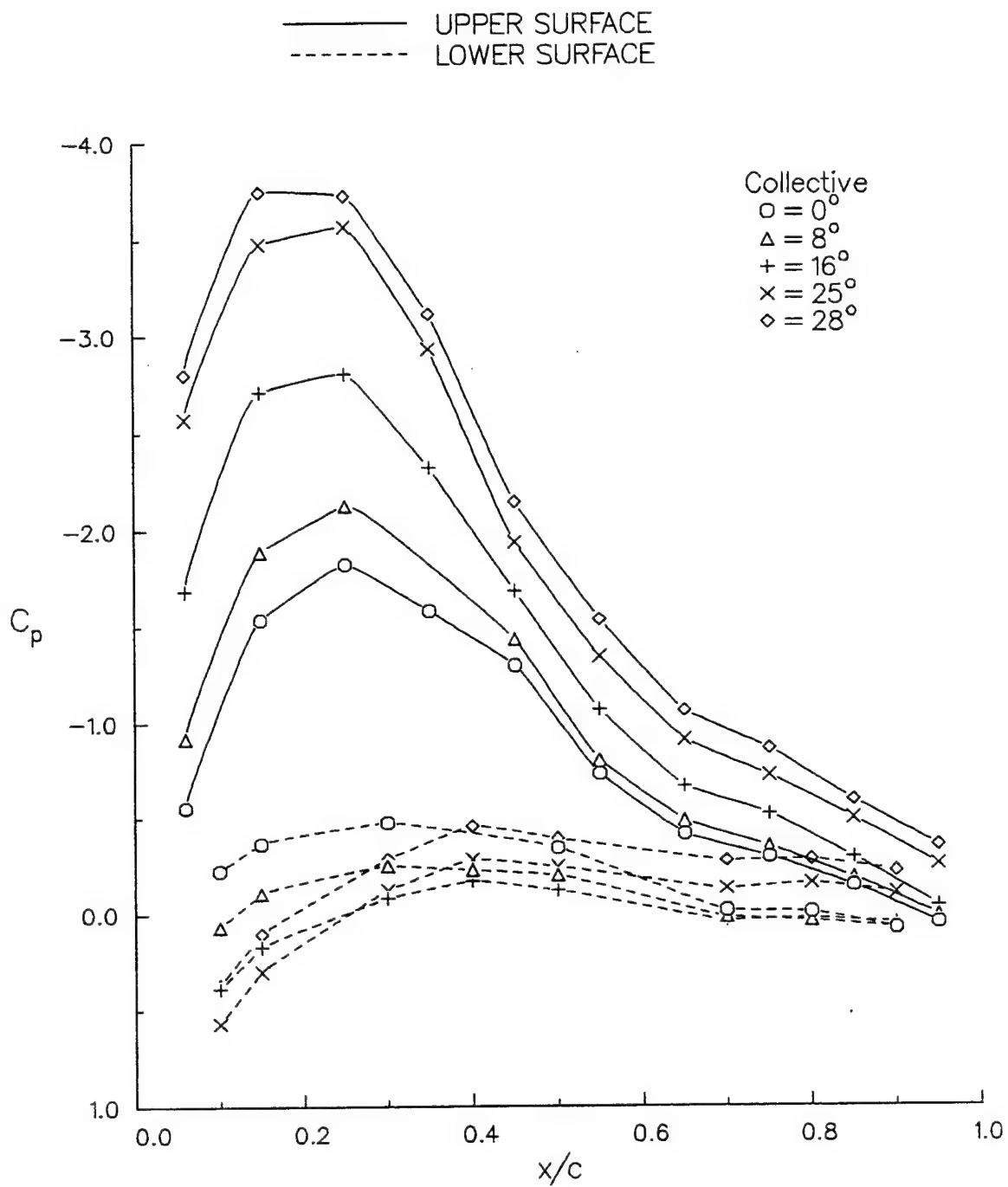
(k) $\theta_c = 27^\circ$

Figure 7. Continued.



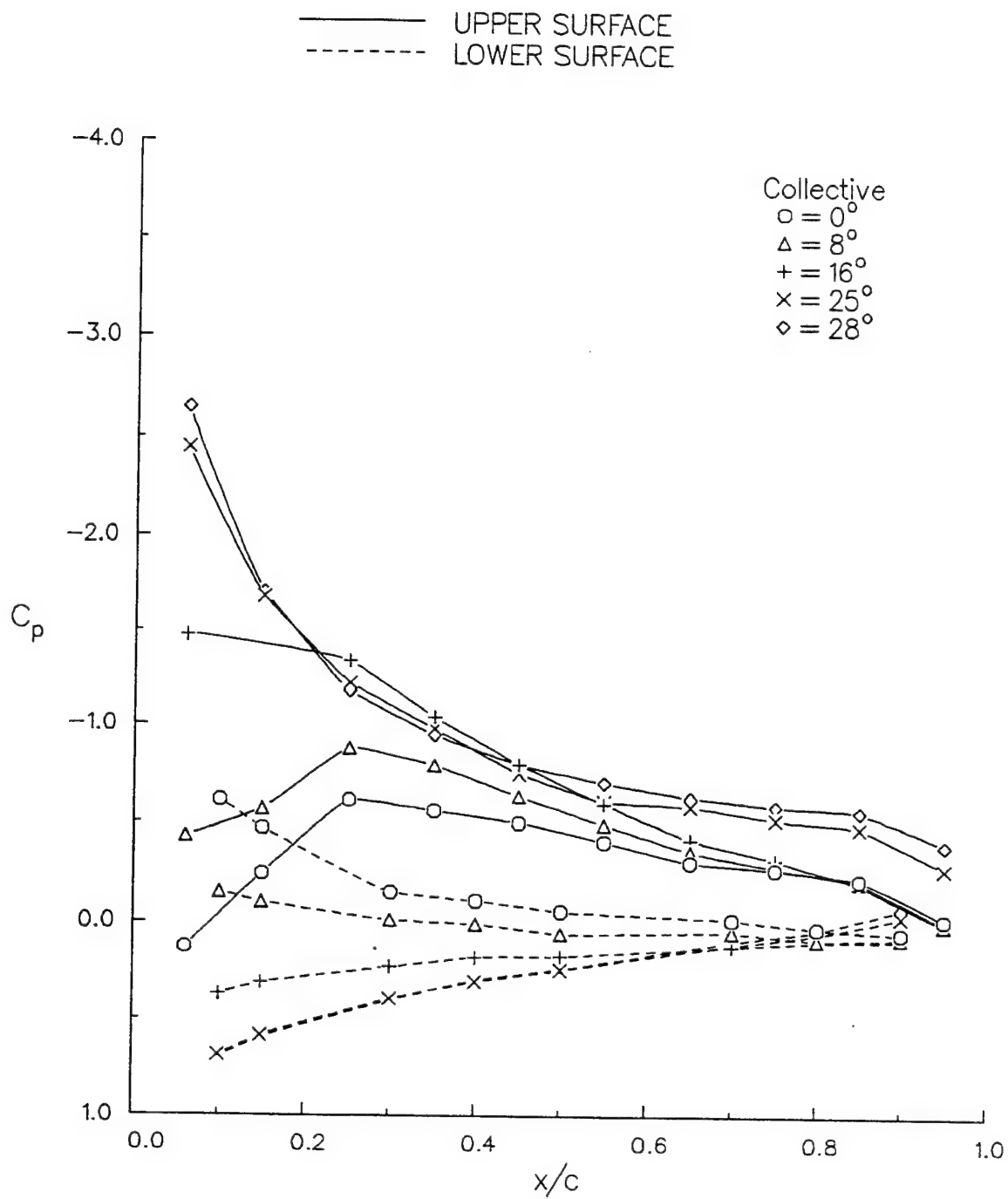
(1) $\theta_c = 28^\circ$

Figure 7. Concluded.



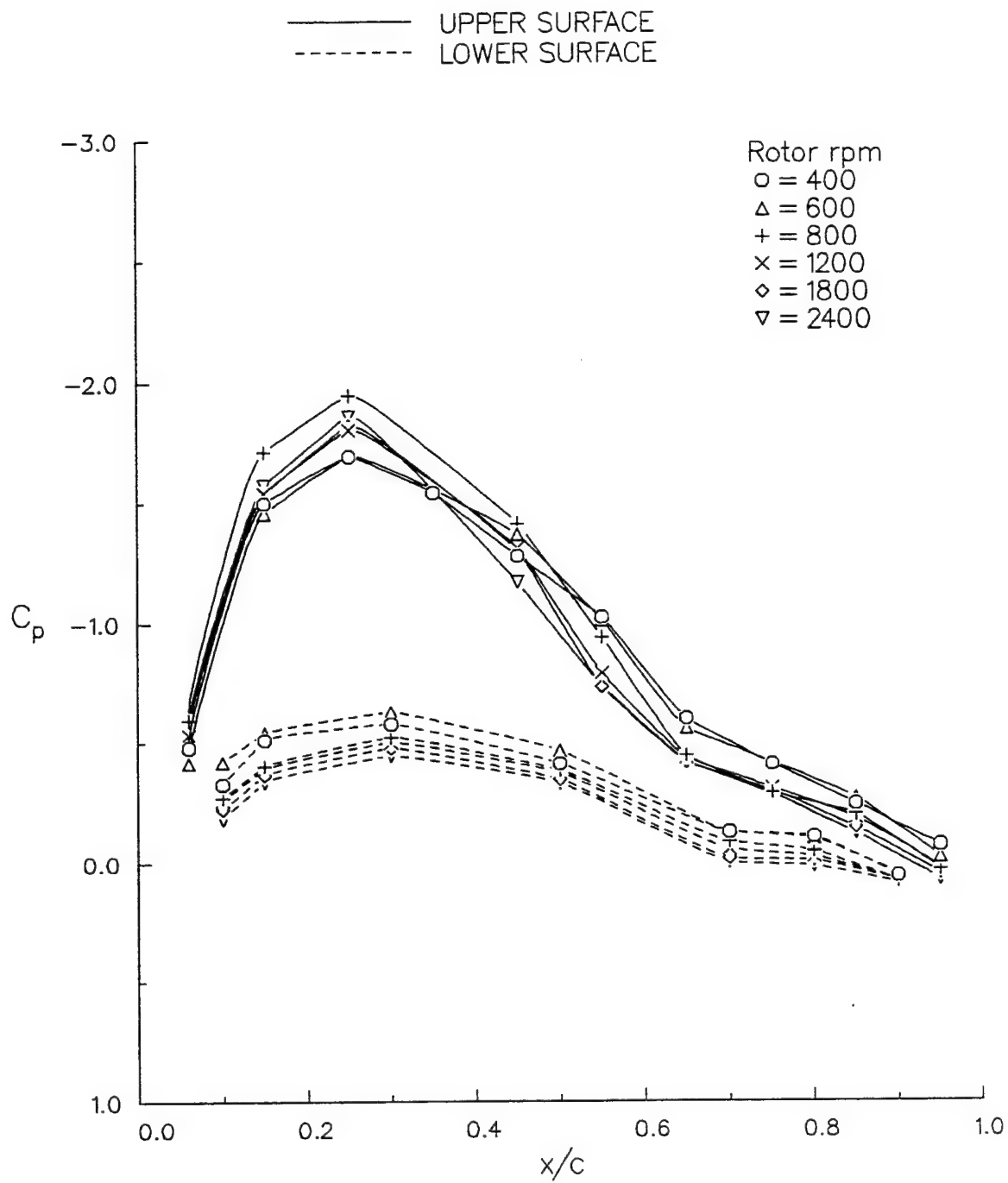
(a) $r/R = 0.20$

Figure 8. Surface pressure distributions for a range of collective pitch angles; rpm = 1800.



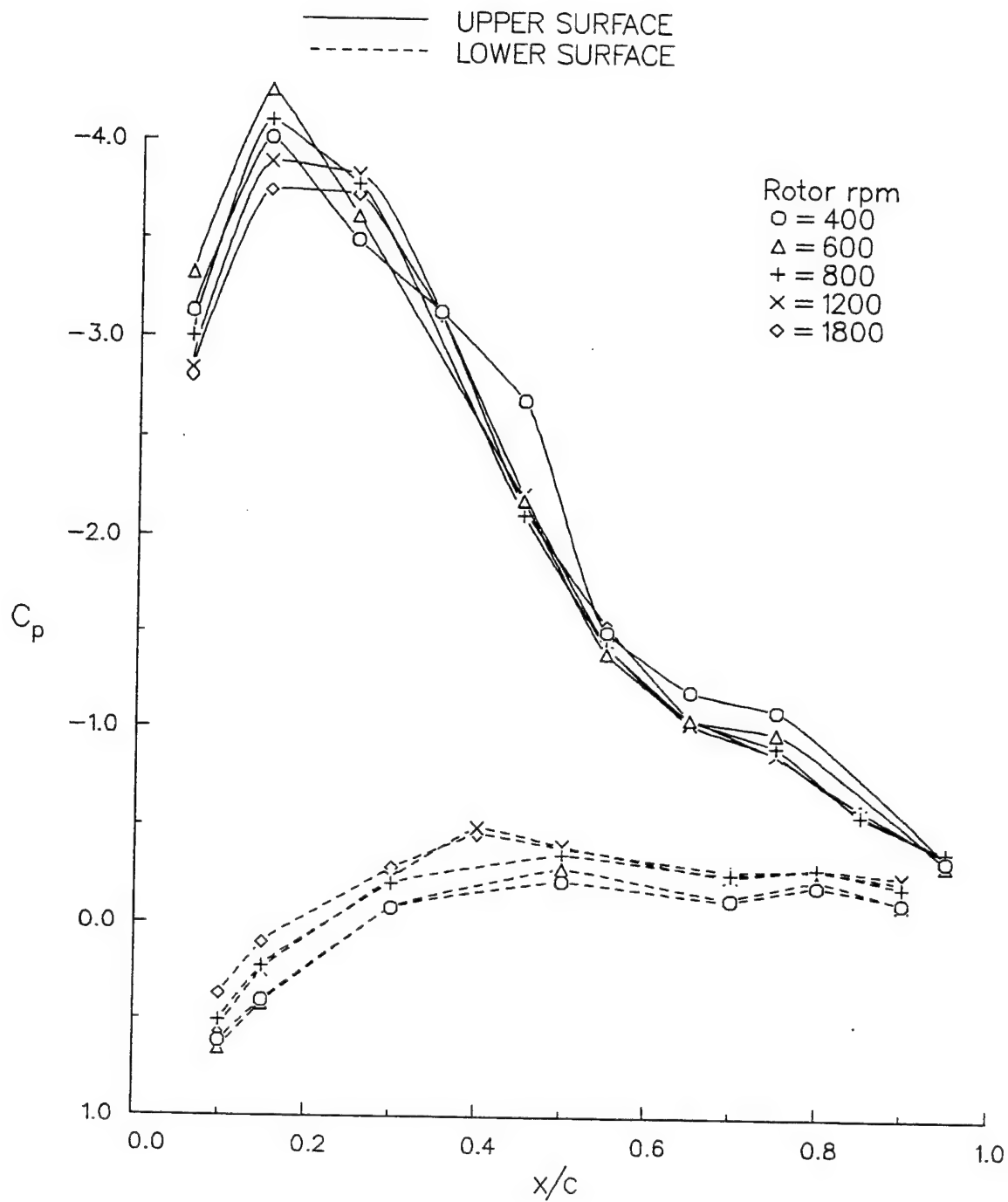
(b) $r/R = 0.75$

Figure 8. Concluded.



(a) $\theta_c = 0^\circ$

Figure 9. Surface pressure distributions for a range of rotor speeds; $r/R = 0.20$.



(b) $\theta_c = 28^\circ$

Figure 9. Concluded.

Appendix A

Pressure Blade Airfoil Coordinates

r/R = 0.155			
x/c	y/c	x/c	y/c
1.0000	0.0059	0.0124	-0.0660
0.9974	0.0114	0.0161	-0.0725
0.9911	0.0167	0.0258	-0.0861
0.9764	0.0250	0.0379	-0.0998
0.9423	0.0424	0.0516	-0.1133
0.8857	0.0674	0.0706	-0.1296
0.8495	0.0827	0.0902	-0.1439
0.7881	0.1069	0.1101	-0.1567
0.7415	0.1250	0.1335	-0.1691
0.6922	0.1432	0.1560	-0.1798
0.6381	0.1626	0.1997	-0.1949
0.5878	0.1801	0.2174	-0.1994
0.5434	0.1945	0.2405	-0.2041
0.4907	0.2119	0.2628	-0.2071
0.4414	0.2258	0.2762	-0.2087
0.3915	0.2376	0.2983	-0.2108
0.3399	0.2457	0.3449	-0.2125
0.2895	0.2474	0.3984	-0.2116
0.2424	0.2406	0.4542	-0.2066
0.1913	0.2246	0.5548	-0.1854
0.1416	0.1991	0.5988	-0.1725
0.0946	0.1641	0.6524	-0.1548
0.0533	0.1193	0.6961	-0.1397
0.0423	0.1043	0.7460	-0.1214
0.0385	0.0986	0.7986	-0.1017
0.0215	0.0702	0.8475	-0.0822
0.0081	0.0380	0.8935	-0.0631
0.0020	0.0130	0.9409	-0.0413
0.0000	-0.0122	0.9767	-0.0216
0.0010	-0.0281	0.9942	-0.0057
0.0041	-0.0447	0.9973	-0.0023
0.0073	-0.0547	1.0000	0.0059
0.0117	-0.0647		

r/R = 0.206			
x/c	y/c	x/c	y/c
1.0000	0.0007	0.0114	-0.0485
0.9904	0.0151	0.0194	-0.0595
0.9797	0.0206	0.0318	-0.0732
0.9712	0.0273	0.0526	-0.0905
0.9341	0.0488	0.0811	-0.1084
0.8928	0.0701	0.1067	-0.1206
0.8427	0.0940	0.1186	-0.1253
0.7931	0.1158	0.1454	-0.1345
0.7433	0.1364	0.1878	-0.1455
0.6966	0.1545	0.2261	-0.1533
0.6398	0.1752	0.2566	-0.1583
0.5928	0.1909	0.2937	-0.1626
0.5477	0.2044	0.3418	-0.1663
0.4972	0.2174	0.3929	-0.1672
0.4469	0.2280	0.4415	-0.1650
0.3901	0.2361	0.4971	-0.1591
0.3455	0.2394	0.5393	-0.1521
0.2917	0.2387	0.5929	-0.1409
0.2434	0.2329	0.6392	-0.1294
0.1902	0.2189	0.6867	-0.1168
0.1454	0.1998	0.7361	-0.1028
0.0941	0.1665	0.7947	-0.0864
0.0575	0.1305	0.8430	-0.0718
0.0407	0.1095	0.8905	-0.0570
0.0338	0.0996	0.9196	-0.0470
0.0165	0.0685	0.9503	-0.0355
0.0094	0.0506	0.9815	-0.0216
0.0017	0.0193	0.9859	-0.0172
0.0000	-0.0072	0.9918	-0.0114
0.0020	-0.0228	0.9996	-0.0062
0.0097	-0.0446	1.0000	0.0007

$r/R = 0.306$			
x/c	y/c	x/c	y/c
1.0000	-0.0025	0.0265	-0.0525
0.9942	0.0054	0.0433	-0.0680
0.9824	0.0114	0.0525	-0.0753
0.9691	0.0190	0.0704	-0.0873
0.9482	0.0304	0.0898	-0.0979
0.9188	0.0451	0.0991	-0.1023
0.8755	0.0648	0.1194	-0.1102
0.8256	0.0858	0.1409	-0.1173
0.7808	0.1033	0.1616	-0.1221
0.7296	0.1220	0.1723	-0.1240
0.6785	0.1394	0.1884	-0.1264
0.6295	0.1545	0.2218	-0.1294
0.5773	0.1684	0.2888	-0.1305
0.5380	0.1777	0.3477	-0.1282
0.4814	0.1890	0.3875	-0.1256
0.4360	0.1958	0.4367	-0.1210
0.3879	0.1998	0.4907	-0.1151
0.3385	0.2009	0.5377	-0.1089
0.2885	0.1969	0.5808	-0.1025
0.2399	0.1901	0.6293	-0.0943
0.1867	0.1768	0.6810	-0.0851
0.1426	0.1607	0.7264	-0.0765
0.0992	0.1394	0.7763	-0.0670
0.0576	0.1101	0.8250	-0.0568
0.0314	0.0829	0.8730	-0.0464
0.0241	0.0727	0.9089	-0.0378
0.0104	0.0477	0.9517	-0.0265
0.0029	0.0259	0.9779	-0.0173
0.0004	0.0034	0.9886	-0.0127
0.0070	-0.0259	1.0000	-0.0025
0.0076	-0.0276		

$r/R = 0.405$			
x/c	y/c	x/c	y/c
1.0000	0.0180	0.0161	-0.0194
0.9854	0.0258	0.0307	-0.0332
0.9549	0.0430	0.0476	-0.0454
0.9105	0.0629	0.0693	-0.0576
0.8540	0.0837	0.0753	-0.0606
0.8062	0.0986	0.0956	-0.0688
0.7542	0.1133	0.1190	-0.0758
0.6968	0.1284	0.1468	-0.0818
0.6523	0.1390	0.1930	-0.0873
0.5999	0.1499	0.2458	-0.0904
0.5510	0.1586	0.3018	-0.0912
0.5044	0.1652	0.3471	-0.0902
0.4472	0.1714	0.3963	-0.0883
0.3941	0.1747	0.4452	-0.0850
0.3443	0.1753	0.4960	-0.0809
0.2989	0.1732	0.5482	-0.0756
0.2488	0.1675	0.5956	-0.0708
0.1951	0.1559	0.6500	-0.0643
0.1468	0.1419	0.6959	-0.0584
0.1025	0.1241	0.7544	-0.0501
0.0590	0.1000	0.7986	-0.0436
0.0406	0.0858	0.8453	-0.0360
0.0363	0.0819	0.8995	-0.0267
0.0265	0.0719	0.9250	-0.0217
0.0174	0.0609	0.9613	-0.0138
0.0081	0.0457	0.9819	-0.0080
0.0032	0.0334	0.9967	0.0006
0.0004	0.0183	1.0012	0.0051
0.0014	0.0069	1.0000	0.0180
0.0066	-0.0065		

$r/R = 0.506$			
x/c	y/c	x/c	y/c
1.0000	0.0024	0.0109	-0.0128
0.9955	0.0101	0.0302	-0.0275
0.9845	0.0156	0.0619	-0.0424
0.9517	0.0291	0.0683	-0.0448
0.9050	0.0450	0.0899	-0.0515
0.8547	0.0607	0.1152	-0.0577
0.8068	0.0737	0.1444	-0.0631
0.7525	0.0875	0.1860	-0.0684
0.7033	0.0984	0.2410	-0.0720
0.6532	0.1083	0.2931	-0.0734
0.6078	0.1161	0.3499	-0.0722
0.5471	0.1246	0.4019	-0.0697
0.4974	0.1296	0.4499	-0.0663
0.4480	0.1332	0.5005	-0.0628
0.3981	0.1360	0.5488	-0.0588
0.3497	0.1372	0.6039	-0.0543
0.2952	0.1354	0.6431	-0.0506
0.2453	0.1305	0.7006	-0.0453
0.1943	0.1216	0.7501	-0.0406
0.1491	0.1102	0.8013	-0.0355
0.0997	0.0920	0.8433	-0.0311
0.0537	0.0690	0.9010	-0.0247
0.0350	0.0565	0.9326	-0.0208
0.0154	0.0393	0.9639	-0.0156
0.0049	0.0255	0.9841	-0.0095
0.0000	0.0102	0.9930	-0.0070
0.0012	0.0018	1.0000	0.0024

$r/R = 0.606$			
x/c	y/c	x/c	y/c
1.0000	0.0018	0.0098	-0.0284
0.9956	0.0112	0.0229	-0.0399
0.9813	0.0171	0.0364	-0.0482
0.9448	0.0307	0.0555	-0.0565
0.8976	0.0454	0.0962	-0.0669
0.8477	0.0594	0.1202	-0.0699
0.7970	0.0719	0.1451	-0.0718
0.7480	0.0825	0.1934	-0.0737
0.6912	0.0925	0.2500	-0.0735
0.6460	0.0993	0.2844	-0.0726
0.5956	0.1054	0.3479	-0.0704
0.5356	0.1111	0.3930	-0.0683
0.4900	0.1141	0.4464	-0.0654
0.4488	0.1160	0.4981	-0.0623
0.3941	0.1169	0.5401	-0.0595
0.3437	0.1157	0.5925	-0.0557
0.2890	0.1113	0.6449	-0.0514
0.2394	0.1052	0.6920	-0.0477
0.1897	0.0959	0.7383	-0.0436
0.1477	0.0854	0.7945	-0.0383
0.1044	0.0700	0.8516	-0.0321
0.0619	0.0506	0.8951	-0.0273
0.0391	0.0375	0.9237	-0.0236
0.0176	0.0217	0.9532	-0.0193
0.0037	0.0058	0.9774	-0.0143
0.0001	-0.0087	0.9930	-0.0120
0.0006	-0.0134	1.0000	0.0018

r/R = 0.707			
x/c	y/c	x/c	y/c
1.0000	-0.0031	0.0049	-0.0098
0.9943	0.0133	0.0148	-0.0191
0.9665	0.0248	0.0267	-0.0266
0.9402	0.0331	0.0500	-0.0356
0.8950	0.0454	0.0532	-0.0363
0.8452	0.0577	0.0935	-0.0433
0.7918	0.0694	0.1168	-0.0453
0.7426	0.0793	0.1351	-0.0464
0.6938	0.0875	0.1867	-0.0476
0.6405	0.0951	0.2434	-0.0477
0.5952	0.1007	0.2895	-0.0473
0.5428	0.1065	0.3426	-0.0460
0.4961	0.1107	0.3927	-0.0451
0.4435	0.1140	0.4462	-0.0432
0.3900	0.1153	0.4872	-0.0422
0.3435	0.1146	0.5401	-0.0404
0.2918	0.1113	0.5944	-0.0384
0.2427	0.1059	0.6456	-0.0360
0.1948	0.0983	0.6892	-0.0338
0.1489	0.0881	0.7342	-0.0312
0.0988	0.0725	0.7857	-0.0281
0.0562	0.0552	0.8363	-0.0247
0.0423	0.0480	0.8865	-0.0217
0.0312	0.0416	0.9161	-0.0196
0.0230	0.0361	0.9477	-0.0169
0.0146	0.0297	0.9745	-0.0137
0.0038	0.0182	0.9823	-0.0145
0.0000	0.0088	1.0000	-0.0031
0.0004	-0.0020		

r/R = 0.756			
x/c	y/c	x/c	y/c
1.0000	-0.0048	0.0119	-0.0111
0.9923	0.0049	0.0169	-0.0145
0.9673	0.0133	0.0307	-0.0214
0.9649	0.0141	0.0412	-0.0251
0.9270	0.0254	0.0712	-0.0312
0.8751	0.0389	0.0936	-0.0337
0.8276	0.0503	0.1179	-0.0352
0.7791	0.0609	0.1392	-0.0361
0.7325	0.0700	0.1859	-0.0370
0.6791	0.0792	0.2256	-0.0374
0.6339	0.0862	0.2838	-0.0377
0.5801	0.0938	0.3352	-0.0375
0.5340	0.0995	0.3853	-0.0373
0.4928	0.1037	0.4375	-0.0365
0.4360	0.1082	0.4851	-0.0361
0.3880	0.1099	0.5327	-0.0352
0.3385	0.1095	0.5773	-0.0345
0.2859	0.1065	0.6283	-0.0331
0.2414	0.1022	0.6822	-0.0317
0.1939	0.0949	0.7283	-0.0302
0.1395	0.0826	0.7807	-0.0285
0.0924	0.0680	0.8238	-0.0267
0.0473	0.0500	0.8796	-0.0245
0.0210	0.0353	0.9048	-0.0233
0.0126	0.0291	0.9350	-0.0218
0.0033	0.0195	0.9680	-0.0196
0.0000	0.0097	0.9835	-0.0176
0.0000	0.0092	0.9923	-0.0164
0.0013	0.0020	1.0000	-0.0048
0.0052	-0.0048		

r/R = 0.805			
x/c	y/c	x/c	y/c
1.0000	0.0010	0.0032	-0.0037
0.9941	0.0102	0.0108	-0.0113
0.9731	0.0192	0.0149	-0.0146
0.9400	0.0292	0.0536	-0.0259
0.8932	0.0416	0.0913	-0.0294
0.8413	0.0539	0.1193	-0.0305
0.8021	0.0622	0.1470	-0.0310
0.7522	0.0717	0.2016	-0.0314
0.6983	0.0808	0.2474	-0.0315
0.6442	0.0889	0.2898	-0.0315
0.5923	0.0958	0.3464	-0.0312
0.5418	0.1014	0.3924	-0.0308
0.4990	0.1050	0.4480	-0.0303
0.4404	0.1078	0.4940	-0.0299
0.4041	0.1081	0.5353	-0.0294
0.3448	0.1063	0.5921	-0.0283
0.2963	0.1029	0.6518	-0.0265
0.2463	0.0978	0.6973	-0.0248
0.1905	0.0891	0.7637	-0.0216
0.1485	0.0796	0.8143	-0.0189
0.0956	0.0639	0.8664	-0.0161
0.0454	0.0438	0.9118	-0.0139
0.0383	0.0402	0.9481	-0.0119
0.0268	0.0337	0.9747	-0.0097
0.0128	0.0242	0.9885	-0.0074
0.0033	0.0147	0.9938	-0.0070
0.0000	0.0066	1.0000	0.0010
0.0001	0.0037		

r/R = 0.856			
x/c	y/c	x/c	y/c
1.0000	-0.0186	0.0000	-0.0109
0.9963	-0.0056	0.0004	-0.0024
0.9762	0.0034	0.0012	-0.0110
0.9588	0.0093	0.0035	-0.0153
0.9140	0.0221	0.0090	-0.0218
0.8724	0.0322	0.0311	-0.0305
0.8129	0.0449	0.0735	-0.0365
0.7647	0.0538	0.1002	-0.0380
0.7105	0.0626	0.1301	-0.0391
0.6684	0.0686	0.1664	-0.0399
0.6121	0.0757	0.2209	-0.0410
0.5664	0.0805	0.2728	-0.0419
0.4971	0.0851	0.3380	-0.0425
0.4417	0.0867	0.3914	-0.0429
0.3966	0.0868	0.4411	-0.0432
0.3522	0.0859	0.5009	-0.0436
0.2879	0.0828	0.5587	-0.0435
0.2450	0.0793	0.6177	-0.0425
0.1922	0.0728	0.6604	-0.0413
0.1464	0.0642	0.7173	-0.0391
0.0886	0.0491	0.7859	-0.0357
0.0396	0.0304	0.8325	-0.0327
0.0258	0.0234	0.8738	-0.0302
0.0175	0.0177	0.9241	-0.0278
0.0102	0.0121	0.9644	-0.0257
0.0045	0.0059	0.9870	-0.0226
0.0006	-0.0014	1.0000	-0.0186

r/R = 0.906			
x/c	y/c	x/c	y/c
1.0000	-0.0118	0.0000	-0.0042
0.9921	0.0045	0.0065	-0.0148
0.9788	0.0112	0.0100	-0.0181
0.9521	0.0205	0.0350	-0.0262
0.9078	0.0321	0.0812	-0.0313
0.8527	0.0441	0.1118	-0.0326
0.7998	0.0531	0.1571	-0.0338
0.7437	0.0610	0.1867	-0.0345
0.6985	0.0666	0.2621	-0.0366
0.6406	0.0732	0.3051	-0.0375
0.5824	0.0784	0.3498	-0.0382
0.5303	0.0809	0.4141	-0.0391
0.4579	0.0815	0.4516	-0.0393
0.3985	0.0806	0.5116	-0.0395
0.3410	0.0789	0.5663	-0.0392
0.2955	0.0771	0.6089	-0.0386
0.2448	0.0745	0.6628	-0.0375
0.1928	0.0703	0.6942	-0.0367
0.1321	0.0621	0.7681	-0.0343
0.0900	0.0532	0.8137	-0.0323
0.0569	0.0426	0.8593	-0.0300
0.0413	0.0358	0.9191	-0.0278
0.0273	0.0283	0.9435	-0.0275
0.0185	0.0226	0.9668	-0.0266
0.0064	0.0121	0.9806	-0.0249
0.0005	0.0012	0.9901	-0.0246
0.0001	-0.0033	1.0000	-0.0118

r/R = 0.959			
x/c	y/c	x/c	y/c
1.0000	-0.0081	0.0000	-0.0040
0.9940	0.0092	0.0037	-0.0087
0.9576	0.0247	0.0101	-0.0133
0.9167	0.0356	0.0351	-0.0195
0.8684	0.0452	0.0820	-0.0243
0.8258	0.0517	0.1111	-0.0261
0.7692	0.0587	0.1508	-0.0283
0.7094	0.0654	0.2061	-0.0302
0.6452	0.0715	0.2693	-0.0319
0.5937	0.0747	0.3452	-0.0333
0.5116	0.0767	0.4025	-0.0339
0.4363	0.0765	0.4523	-0.0342
0.3727	0.0751	0.5096	-0.0341
0.3077	0.0722	0.5737	-0.0335
0.2468	0.0683	0.6211	-0.0329
0.1901	0.0628	0.6791	-0.0318
0.1441	0.0570	0.7291	-0.0307
0.0940	0.0484	0.8097	-0.0277
0.0495	0.0363	0.8677	-0.0257
0.0373	0.0313	0.9107	-0.0246
0.0223	0.0238	0.9518	-0.0234
0.0076	0.0131	0.9646	-0.0218
0.0018	0.0049	0.9868	-0.0181
0.0001	-0.0031	1.0000	-0.0081

Appendix B

Pressure Blade Airfoil Coordinates

Nomenclature

COLL	collective angle at $0.75R$, θ_c , deg
C_{pl}	lower surface pressure coefficient, C_p
C_{pu}	upper surface pressure coefficient, C_p
CQ/S	rotor torque coefficient over solidity, C_Q/σ
CT/S	rotor thrust coefficient over solidity, C_T/σ
DENSITY	air density, ρ , slugs/ft ³
PRESS	ambient pressure, P_∞ , lb/in. ²
RPM	rotor rotation speed, rev/min
r/R	nondimensional rotor radius
TEMP	ambient air temperature, °F
THRUST	rotor thrust, lb
TORQUE	rotor torque, ft-lb
x/c	nondimensional chord location

COLL = 0
 TORQUE = 0.66
 PRESS = 14.756

RPM = 400
 CT/S = 0.1416
 TEMP = 62.22

THRUST = 3.52
 CQ/S = 0.0133
 DENSITY = 0.002363

Cpu

r/R x/c	0.125	0.20	0.30
0.06	-0.6495	-0.4812	-0.8003
0.15	-2.2595	-1.4992	-1.2395
0.25	-3.3915	-1.6965	-1.3446
0.35	-3.2764	-1.5414	-1.3007
0.45	-2.4963	-1.2758	-1.0996
0.55	-1.4253	-1.0221	-0.8919
0.65	-1.0724	-0.5996	-0.7429
0.75	-1.1674	-0.4076	-0.3740
0.85	-0.9441	-0.2423	-0.1507
0.95	-0.8444	-0.072	0.0499

Cpl

r/R x/c	0.125	0.20	0.30
0.10	-0.9516	-0.3282	-0.3908
0.15	-1.1217	-0.5131	-0.6071
0.30	-1.3703	-0.5791	-0.4864
0.40	****	****	-0.5495
0.50	-1.1121	-0.4109	-0.2511
0.70	-0.5612	-0.1271	-0.1344
0.80	-0.8565	-0.1066	-0.1147
0.90	-0.5703	0.0566	0.0522

COLL = 0
 TORQUE = 0.99
 PRESS = 14.756

RPM = 600
 CT/S = 0.0946
 TEMP = 62.17

THRUST = 5.30
 CQ/S = 0.0088
 DENSITY = 0.002363

Cpu

r/R x/c	0.125	0.20	0.30
0.06	-0.6525	-0.4183	-0.7847
0.15	-2.4165	-1.4551	-1.1718
0.25	-3.2502	-1.6970	-1.3725
0.35	-3.1646	-1.5874	-1.2724
0.45	-2.5000	-1.3651	-1.0687
0.55	-1.3517	-1.0091	-0.8866
0.65	-1.1562	-0.5581	-0.6353
0.75	-1.1326	-0.4156	-0.2951
0.85	-1.1520	-0.2679	-0.1650
0.95	-0.8893	-0.0218	0.0504

Cpl

r/R x/c	0.125	0.20	0.30
0.10	-1.0609	-0.4225	-0.4234
0.15	-1.1143	-0.5435	-0.6467
0.30	-1.3636	-0.6274	-0.5110
0.40	****	****	-0.4972
0.50	-1.0774	-0.4644	-0.2581
0.70	-0.7343	-0.1277	-0.1313
0.80	-0.9086	-0.0998	-0.0525
0.90	-0.6726	0.0505	0.0432

COLL = 0
TORQUE = 1.28
PRESS = 14.756

RPM = 800
CT/S = 0.0546
TEMP = 62.39

THRUST = 5.43
CQ/S = 0.0064
DENSITY = 0.002363

Cpu

r/R \ x/c	0.125	0.20	0.30	0.40
0.06	-0.7720	-0.5964	-0.8753	-0.6802
0.15	-2.3731	-1.7157	-1.2331	-0.9496
0.25	-3.1938	-1.9471	-1.4282	-1.1096
0.35	-2.9967	-1.6974	-1.3043	-1.0180
0.45	-2.0054	-1.4100	-1.0640	-0.8754
0.55	-1.2619	-0.9386	-0.8448	-0.7476
0.65	-1.0351	-0.4435	-0.5782	-0.5264
0.75	-1.0308	-0.2868	-0.2819	-0.2671
0.85	-1.1887	-0.2004	-0.1330	-0.1964
0.95	-0.7900	0.0314	0.0566	0.0897

r/R \ x/c	0.50	0.60	0.70	0.75
0.06	-0.3011	-0.2360	-0.0931	0.1099
0.15	-0.7567	-0.6031	-0.4296	-0.3179
0.25	-0.8180	-0.6934	-0.5363	-0.4782
0.35	-0.8098	-0.7116	-0.5812	-0.5502
0.45	-0.6792	-0.6448	-0.5356	-0.5333
0.55	-0.5966	-0.5694	-0.4767	-0.4564
0.65	-0.5090	-0.4930	-0.4055	-0.3886
0.75	-0.3442	-0.3904	-0.3495	-0.3429
0.85	-0.1954	-0.2392	-0.2952	-0.2868
0.95	0.0442	0.0257	-0.0414	-0.0624

Cpl

r/R \ x/c	0.125	0.20	0.30	0.40
0.10	-0.5781	-0.2719	-0.3591	-0.5079
0.15	-0.9102	-0.4040	-0.5875	-0.5824
0.30	-1.0610	-0.5226	-0.4706	-0.3812
0.40	****	****	-0.4530	-0.3359
0.50	-0.9337	-0.3831	-0.2308	-0.2152
0.70	-0.5929	-0.0861	-0.1208	-0.0497
0.80	-0.7991	-0.0471	-0.0404	-0.0219
0.90	-0.5395	0.0788	0.0467	0.0568

r/R \ x/c	0.50	0.60	0.70	0.75
0.10	-0.4229	-0.6287	-0.5955	-0.5784
0.15	-0.4487	-0.5065	-0.4893	-0.4769
0.30	-0.3821	-0.2911	-0.2169	-0.1641
0.40	-0.3122	-0.2204	-0.1515	-0.1214
0.50	-0.1768	-0.1195	-0.1006	-0.0826
0.70	-0.0177	-0.0444	-0.0402	-0.0285
0.80	0.0020	-0.0240	-0.0045	0.0024
0.90	0.0576	0.0395	0.0458	0.0381

COLL = 0
TORQUE = 2.13
PRESS = 14.756

RPM = 1200
CT/S = 0.0386
TEMP = 62.32

THRUST = 8.65
CQ/S = 0.0048
DENSITY = 0.002363

Cpu

r/R \ x/c	0.125	0.20	0.30	0.40
0.06	-0.8260	-0.5342	-0.9775	-0.7171
0.15	-2.5671	-1.5419	-1.3223	-0.9772
0.25	-3.3517	-1.8076	-1.5673	-1.1862
0.35	-3.2113	-1.5977	-1.4177	-1.0423
0.45	-1.9574	-1.3085	-1.1615	-0.8900
0.55	-1.2908	-0.7899	-0.9120	-0.7360
0.65	-1.0438	-0.4346	-0.5198	-0.4769
0.75	-1.0629	-0.3078	-0.2911	-0.2680
0.85	-1.0112	-0.1843	-0.1005	-0.1751
0.95	-0.7602	0.0194	0.1083	0.1238

r/R \ x/c	0.50	0.60	0.70	0.75
0.06	-0.2894	-0.2138	-0.0863	0.1254
0.15	-0.7454	-0.5748	-0.4441	-0.2904
0.25	-0.8104	-0.6516	-0.5387	-0.4843
0.35	-0.8157	-0.7063	-0.5912	-0.5583
0.45	-0.6538	-0.6433	-0.5448	-0.5309
0.55	-0.5715	-0.5279	-0.4724	-0.4307
0.65	-0.4389	-0.4253	-0.3828	-0.3310
0.75	-0.3201	-0.3441	-0.3239	-0.2884
0.85	-0.1982	-0.2127	-0.2596	-0.2399
0.95	0.0521	0.0541	-0.0339	-0.0409

Cpl

r/R \ x/c	0.125	0.20	0.30	0.40
0.10	-0.4891	-0.2619	-0.3673	-0.4975
0.15	-0.6560	-0.3927	-0.6255	-0.5816
0.30	-0.9164	-0.5003	-0.4999	-0.3935
0.40	****	****	-0.4254	-0.3322
0.50	-0.8973	-0.3724	-0.2506	-0.2156
0.70	-0.5944	-0.0550	-0.0744	-0.0514
0.80	-0.7519	-0.0244	-0.0170	-0.0180
0.90	-0.5796	0.0750	0.0546	0.0489

r/R \ x/c	0.50	0.60	0.70	0.75
0.10	-0.4185	-0.6381	-0.5916	-0.6209
0.15	-0.4521	-0.5152	-0.4900	-0.4982
0.30	-0.3867	-0.2959	-0.1885	-0.1669
0.40	-0.3074	-0.2074	-0.1493	-0.1229
0.50	-0.1878	-0.0902	-0.1002	-0.0772
0.70	-0.0197	-0.0507	-0.0396	-0.0292
0.80	0.0017	-0.0297	-0.0019	0.0071
0.90	0.0518	0.0284	0.0506	0.0363

COLL = 0
TORQUE = 3.83
PRESS = 14.756

RPM = 1800
CT/S = 0.0318
TEMP = 62.28

THRUST = 16.04
CQ/S = 0.0038
DENSITY = 0.002363

Cpu

r/R x/c	0.125	0.20	0.30	0.40
0.06	-0.8540	-0.5554	-0.9261	-0.6983
0.15	-2.5262	-1.5363	-1.2485	-0.9589
0.25	-3.2047	-1.8248	-1.4810	-1.1087
0.35	-3.0929	-1.5824	-1.3474	-1.0342
0.45	-1.8019	-1.2963	-1.0978	-0.8084
0.55	-1.2430	-0.7333	-0.7829	-0.6513
0.65	-0.9972	-0.4156	-0.5018	-0.4460
0.75	-1.0554	-0.2949	-0.2612	-0.2301
0.85	-1.0302	-0.1454	-0.0891	-0.1078
0.95	-0.8710	0.0462	0.0923	0.1479

r/R x/c	0.50	0.60	0.70	0.75
0.06	-0.3220	-0.2019	-0.0756	0.1275
0.15	-0.7761	-0.5611	-0.4541	-0.2438
0.25	-0.8235	-0.6386	-0.5282	-0.6131
0.35	-0.7658	-0.6924	-0.5800	-0.5605
0.45	-0.6005	-0.5519	-0.5295	-0.5009
0.55	-0.5779	-0.4960	-0.4556	-0.4073
0.65	-0.4195	-0.4174	-0.3641	-0.3049
0.75	-0.2955	-0.3257	-0.3021	-0.2700
0.85	-0.1763	-0.1859	-0.2455	-0.2195
0.95	0.0829	0.0864	-0.0093	-0.0201

Cpl

r/R x/c	0.125	0.20	0.30	0.40
0.10	-0.4385	-0.2237	-0.3715	-0.5067
0.15	-0.6915	-0.3653	-0.6190	-0.5895
0.30	-0.8957	-0.4760	-0.4943	-0.3960
0.40	****	****	-0.3925	-0.3237
0.50	-0.8316	-0.3435	-0.2425	-0.2097
0.70	-0.5454	-0.0173	-0.0628	-0.0587
0.80	-0.6771	-0.0083	-0.0160	-0.0245
0.90	-0.4855	0.0768	0.0477	0.0340

r/R x/c	0.50	0.60	0.70	0.75
0.10	-0.3937	-0.6479	-0.5863	-0.6140
0.15	-0.4346	-0.5193	-0.4942	-0.4713
0.30	-0.3712	-0.2839	-0.1703	-0.1488
0.40	-0.2481	-0.1602	-0.1421	-0.1084
0.50	-0.1480	-0.0816	-0.0902	-0.0570
0.70	-0.0171	-0.0493	-0.0289	-0.0161
0.80	0.0100	-0.0277	0.0118	0.0269
0.90	0.0560	0.0251	0.0649	0.0507

COLL = 0
 TORQUE = 6.37
 PRESS = 14.756

RPM = 2400
 CT/S = 0.0298
 TEMP = 62.29

THRUST = 26.71
 CQ/S = 0.0036
 DENSITY = 0.002363

Cpu

r/R \ x/c	0.125	0.20	0.30	0.40
0.06	-0.8150	-0.5811	-0.9619	-0.6676
0.15	-2.4203	-1.5727	-1.3004	-0.9207
0.25	-3.0602	-1.8617	-1.3894	-1.0567
0.35	-2.9125	-1.6030	-1.3420	-0.9995
0.45	-1.7911	-1.1668	-1.0889	-0.7499
0.55	-1.1950	-0.7365	-0.7680	-0.6134
0.65	-0.9702	-0.4195	-0.4778	-0.4170
0.75	-1.0843	-0.2822	-0.2239	-0.2143
0.85	-1.0435	-0.1208	-0.0571	-0.0953
0.95	-0.7827	0.0713	0.0974	0.1519

r/R \ x/c	0.50	0.60	0.70	0.75
0.06	-0.2966	-0.1850	-0.0565	0.1272
0.15	-0.7303	-0.5411	-0.4331	-0.2231
0.25	-0.7981	-0.6139	-0.5004	-0.5598
0.35	-0.7359	-0.6559	-0.5586	-0.5258
0.45	-0.5757	-0.5238	-0.5051	-0.4669
0.55	-0.5526	-0.4681	-0.4268	-0.3672
0.65	-0.3986	-0.3824	-0.3370	-0.2740
0.75	-0.2739	-0.2810	-0.2744	-0.2307
0.85	-0.1526	-0.1236	-0.2170	-0.1797
0.95	0.1083	0.0989	0.0200	0.0142

Cpl

r/R \ x/c	0.125	0.20	0.30	0.40
0.10	-0.3345	-0.1860	-0.3499	-0.4837
0.15	-0.6098	-0.3371	-0.6197	-0.5666
0.30	-0.8031	-0.4448	-0.5001	-0.3799
0.40	****	****	-0.3791	-0.3097
0.50	-0.7898	-0.3293	-0.2385	-0.1712
0.70	-0.5206	-0.0011	-0.0654	-0.0544
0.80	-0.6717	0.0159	-0.0107	-0.0199
0.90	-0.5375	0.0884	0.0501	0.0353

r/R \ x/c	0.50	0.60	0.70	0.75
0.10	-0.3782	-0.6226	-0.5610	-0.5928
0.15	-0.4235	-0.5005	-0.4918	-0.3878
0.30	-0.3518	-0.2238	-0.1529	-0.1206
0.40	-0.2314	-0.1505	-0.1275	-0.0919
0.50	-0.1329	-0.0735	-0.0714	-0.0353
0.70	-0.0112	-0.0405	-0.0114	0.0053
0.80	0.0183	-0.0224	0.0302	0.0489
0.90	0.0612	0.0209	0.0793	0.0685

COLL = 4
 TORQUE = 0.77
 PRESS = 14.756

RPM = 400
 CT/S = 0.1416
 TEMP = 59.19

THRUST = 3.54
 CQ/S = 0.0154
 DENSITY = 0.002376

Cpu

r/R x/c	0.125	0.20	0.30
0.06	-0.9120	-0.6163	-1.0859
0.15	-3.0905	-1.7879	-1.4252
0.25	-3.7900	-2.1028	-1.4447
0.35	-3.4111	-1.6706	-1.3977
0.45	-2.9788	-1.5432	-1.2321
0.55	-1.5084	-1.0331	-0.9829
0.65	-1.1233	-0.5971	-0.6880
0.75	-1.0075	-0.3345	-0.2986
0.85	-1.1877	-0.2708	-0.1836
0.95	-0.8165	-0.0116	0.0542

Cpl

r/R x/c	0.125	0.20	0.30
0.10	-0.7033	-0.2453	-0.2318
0.15	-0.7604	-0.3805	-0.4262
0.30	-0.9581	-0.4697	-0.3988
0.40	****	****	-0.3731
0.50	-0.9762	-0.3290	-0.2023
0.70	-0.6370	-0.0995	-0.1031
0.80	-0.6366	-0.0070	-0.0873
0.90	-0.6205	0.0378	0.0591

COLL = 4
 TORQUE = 1.22
 PRESS = 14.756

RPM = 600
 CT/S = 0.0959
 TEMP = 59.41

THRUST = 5.40
 CQ/S = 0.0108
 DENSITY = 0.002375

Cpu

r/R x/c	0.125	0.20	0.30
0.06	-1.0904	-0.8227	-1.2638
0.15	-2.7822	-1.9161	-1.5757
0.25	-3.5868	-2.1454	-1.6526
0.35	-3.4449	-1.8595	-1.5429
0.45	-2.6677	-1.5589	-1.2864
0.55	-1.4796	-0.9884	-1.0608
0.65	-1.2449	-0.5068	-0.6793
0.75	-1.2443	-0.2908	-0.3215
0.85	-1.1045	-0.2015	-0.1928
0.95	-0.9687	0.0544	0.0543

Cpl

r/R x/c	0.125	0.20	0.30
0.10	-0.4888	-0.0240	-0.1931
0.15	-0.7615	-0.1267	-0.4104
0.30	-0.9369	-0.3024	-0.3960
0.40	****	-0.2854	-0.4123
0.50	-0.8568	-0.2210	-0.1868
0.70	-0.6127	-0.0183	-0.1145
0.80	-0.6812	0.0285	-0.0916
0.90	-0.5364	0.1240	0.0537

COLL = 4
TORQUE = 1.50
PRESS = 14.756

RPM = 800
CT/S = 0.0815
TEMP = 59.83

THRUST = 8.15
CQ/S = 0.0075
DENSITY = 0.002373

Cpu

r/R \ x/c	0.125	0.20	0.30	0.40
0.06	-1.1377	-0.7225	-1.1623	-0.9496
0.15	-2.8314	-1.7448	-1.4101	-1.1165
0.25	-3.5660	-1.9944	-1.5250	-1.2595
0.35	-3.4967	-1.7395	-1.4381	-1.0905
0.45	-2.1849	-1.3951	-1.1832	-0.9145
0.55	-1.4239	-0.9279	-0.9607	-0.7681
0.65	-1.2160	-0.4928	-0.5688	-0.5192
0.75	-1.0616	-0.3464	-0.2978	-0.2668
0.85	-1.1578	-0.2190	-0.1730	-0.1640
0.95	-0.7279	0.0015	0.0767	0.0921

r/R \ x/c	0.50	0.60	0.70	0.75
0.06	-0.6040	-0.4609	-0.3056	-0.0982
0.15	-0.9700	-0.7592	-0.5999	-0.3653
0.25	-0.9908	-0.8112	-0.6630	-0.6987
0.35	-0.9503	-0.7965	-0.6873	-0.6426
0.45	-0.7905	-0.6891	-0.6127	-0.5915
0.55	-0.6752	-0.6018	-0.5183	-0.4769
0.65	-0.5262	-0.5345	-0.4441	-0.3777
0.75	-0.3284	-0.4592	-0.3819	-0.3113
0.85	-0.2018	-0.2359	-0.2713	-0.2483
0.95	0.0615	0.0280	-0.0249	-0.0405

Cpl

r/R \ x/c	0.125	0.20	0.30	0.40
0.10	-0.3007	-0.1171	-0.1773	-0.2570
0.15	-0.2535	-0.2561	-0.3715	-0.3701
0.30	-0.6325	-0.4030	-0.3607	-0.2506
0.40	****	-0.4438	-0.3898	-0.2090
0.50	-0.6712	-0.3221	-0.1704	-0.1298
0.70	-0.5206	-0.0720	-0.0963	-0.0459
0.80	-0.5582	-0.0102	-0.0603	-0.0079
0.90	-0.4200	0.0865	0.0763	0.0569

r/R \ x/c	0.50	0.60	0.70	0.75
0.10	-0.2000	-0.4055	-0.4090	-0.4329
0.15	-0.2721	-0.3366	-0.3430	-0.3216
0.30	-0.2767	-0.1798	-0.1544	-0.1471
0.40	-0.2125	-0.1455	-0.1215	-0.1197
0.50	-0.1094	-0.0810	-0.0728	-0.0647
0.70	-0.0139	-0.0169	-0.0209	-0.0084
0.80	0.0106	-0.0009	0.0149	0.0179
0.90	0.0703	0.0554	0.0606	0.0382

COLL = 4
TORQUE = 2.82
PRESS = 14.756

RPM = 1200
CT/S = 0.0677
TEMP = 60.19

THRUST = 15.21
CQ/S = 0.0063
DENSITY = 0.002371

Cpu

r/R x/c	0.125	0.20	0.30	0.40
0.06	-1.0174	-0.6947	-1.1631	-0.9461
0.15	-2.7220	-1.6609	-1.4241	-1.1113
0.25	-3.4009	-1.9000	-1.5974	-1.2691
0.35	-3.2554	-1.6428	-1.4449	-1.0877
0.45	-1.9812	-1.3909	-1.1740	-0.9187
0.55	-1.3700	-0.8206	-0.8622	-0.7078
0.65	-1.1237	-0.4714	-0.5234	-0.4734
0.75	-1.0764	-0.3484	-0.2876	-0.2517
0.85	-1.0968	-0.1775	-0.1273	-0.1285
0.95	-0.8744	0.0321	0.0793	0.1177

r/R x/c	0.50	0.60	0.70	0.75
0.06	-0.5765	-0.4430	-0.2998	-0.0922
0.15	-0.9400	-0.7329	-0.6043	-0.3648
0.25	-0.9554	-0.7967	-0.6618	-0.7165
0.35	-0.9113	-0.7844	-0.6841	-0.6622
0.45	-0.7378	-0.6762	-0.6051	-0.5833
0.55	-0.6105	-0.5861	-0.5157	-0.4629
0.65	-0.4542	-0.5104	-0.4074	-0.3429
0.75	-0.3104	-0.3636	-0.3286	-0.2892
0.85	-0.1750	-0.2239	-0.2560	-0.2300
0.95	0.0852	0.0476	-0.0181	-0.0226

Cpl

r/R x/c	0.125	0.20	0.30	0.40
0.10	-0.3184	-0.1195	-0.1719	-0.2640
0.15	-0.4876	-0.2534	-0.3935	-0.3757
0.30	-0.7216	-0.3867	-0.3627	-0.2700
0.40	****	-0.4092	-0.3381	-0.2198
0.50	-0.6757	-0.2903	-0.1782	-0.1387
0.70	-0.4775	-0.0410	-0.0929	-0.0533
0.80	-0.6166	0.0138	-0.0218	-0.0081
0.90	-0.5485	0.0961	0.0641	0.0538

r/R x/c	0.50	0.60	0.70	0.75
0.10	-0.1918	-0.4057	-0.4163	-0.4339
0.15	-0.2664	-0.3339	-0.3523	-0.3203
0.30	-0.2706	-0.1832	-0.1564	-0.1473
0.40	-0.2108	-0.1420	-0.1207	-0.0781
0.50	-0.1133	-0.0841	-0.0617	-0.0344
0.70	-0.0045	-0.0230	-0.0128	-0.0065
0.80	0.0200	0.0036	0.0214	0.0283
0.90	0.0638	0.0555	0.0641	0.0433

COLL = 4
TORQUE = 5.66
PRESS = 14.756

RPM = 1800
CT/S = 0.0598
TEMP = 59.71

THRUST = 30.27
CQ/S = 0.0056
DENSITY = 0.002372

Cpu

r/R \ x/c	0.125	0.20	0.30	0.40
0.06	-0.9713	-0.6955	-1.1462	-0.9197
0.15	-2.6746	-1.6997	-1.3764	-1.0875
0.25	-3.4166	-1.9419	-1.4730	-1.1973
0.35	-3.1625	-1.7024	-1.3931	-1.0791
0.45	-1.9424	-1.3493	-1.1173	-0.8390
0.55	-1.2198	-0.8027	-0.7895	-0.6523
0.65	-1.0897	-0.4522	-0.5016	-0.4367
0.75	-1.0529	-0.3215	-0.2602	-0.2078
0.85	-1.0458	-0.1581	-0.1186	-0.0674
0.95	-0.877	0.0396	0.0759	0.1393

r/R \ x/c	0.50	0.60	0.70	0.75
0.06	-0.5599	-0.4263	-0.2772	-0.0726
0.15	-0.9257	-0.7136	-0.5981	-0.3605
0.25	-0.9227	-0.7628	-0.6376	-0.7028
0.35	-0.8321	-0.7596	-0.6583	-0.6883
0.45	-0.6352	-0.5894	-0.5799	-0.5568
0.55	-0.5873	-0.5251	-0.4891	-0.4412
0.65	-0.4191	-0.4268	-0.3782	-0.3310
0.75	-0.2801	-0.3407	-0.3029	-0.2632
0.85	-0.1453	-0.1992	-0.2404	-0.2017
0.95	0.1109	0.0894	0.0054	0.0055

Cpl

r/R \ x/c	0.125	0.20	0.30	0.40
0.10	-0.3756	-0.1055	-0.1775	-0.2792
0.15	-0.5812	-0.2305	-0.4236	-0.3901
0.30	-0.7821	-0.3781	-0.3800	-0.2797
0.40	****	-0.3987	-0.3065	-0.2227
0.50	-0.7619	-0.2856	-0.1787	-0.1481
0.70	-0.5237	-0.0092	-0.0616	-0.0447
0.80	-0.6587	0.0165	-0.0063	-0.0016
0.90	-0.5112	0.0808	0.0507	0.0386

r/R \ x/c	0.50	0.60	0.70	0.75
0.10	-0.1860	-0.4119	-0.3987	-0.4230
0.15	-0.2599	-0.3410	-0.3452	-0.3125
0.30	-0.2685	-0.1809	-0.1081	-0.0806
0.40	-0.2058	-0.1369	-0.0904	-0.0559
0.50	-0.0944	-0.0590	-0.0490	-0.0175
0.70	0.0029	-0.0109	-0.0046	0.0045
0.80	0.0249	0.0036	0.0306	0.0456
0.90	0.0572	0.0498	0.0738	0.0538

COLL = 4
 TORQUE = 10.04
 PRESS = 14.756

RPM = 2400
 CT/S = 0.0568
 TEMP = 59.24

THRUST = 51.09
 CQ/S = 0.0056
 DENSITY = 0.002375

Cpu

r/R x/c	0.125	0.20	0.30	0.40
0.06	-0.9754	-0.6713	-1.0954	-0.8988
0.15	-2.7090	-1.6253	-1.3376	-1.0677
0.25	-3.4447	-1.9307	-1.4064	-1.1653
0.35	-3.1791	-1.6753	-1.3257	-1.0656
0.45	-1.9712	-1.2265	-1.0688	-0.7937
0.55	-1.3218	-0.7929	-0.7548	-0.6241
0.65	-1.0525	-0.4590	-0.4820	-0.4161
0.75	-1.0920	-0.3097	-0.2423	-0.1996
0.85	-1.0582	-0.1551	-0.1060	-0.0567
0.95	-0.8749	0.0471	0.0598	0.1446

r/R x/c	0.50	0.60	0.70	0.75
0.06	-0.5362	-0.4036	-0.2480	-0.0466
0.15	-0.8740	-0.7000	-0.5720	-0.3580
0.25	-0.8995	-0.7374	-0.6056	-0.6827
0.35	-0.8049	-0.7383	-0.6358	-0.6415
0.45	-0.6132	-0.5701	-0.5544	-0.5296
0.55	-0.5614	-0.5030	-0.4573	-0.4077
0.65	-0.3957	-0.4050	-0.3520	-0.3059
0.75	-0.2600	-0.3078	-0.2779	-0.2361
0.85	-0.1225	-0.1569	-0.2112	-0.1715
0.95	0.1323	0.1212	0.0341	0.0333

Cpl

r/R x/c	0.125	0.20	0.30	0.40
0.10	-0.2645	-0.0921	-0.1859	-0.2711
0.15	-0.5892	-0.2505	-0.4310	-0.3842
0.30	-0.7229	-0.3778	-0.3820	-0.2713
0.40	****	-0.3865	-0.2975	-0.2090
0.50	-0.7062	-0.2873	-0.1825	-0.1430
0.70	-0.5176	0.0023	-0.0487	-0.0237
0.80	-0.6194	0.0143	-0.0072	0.0045
0.90	-0.5342	0.0800	0.0454	0.0370

r/R x/c	0.50	0.60	0.70	0.75
0.10	-0.1807	-0.4090	-0.3820	-0.4043
0.15	-0.2572	-0.3363	-0.3492	-0.2996
0.30	-0.2470	-0.1748	-0.0871	-0.0554
0.40	-0.1525	-0.0993	-0.0739	-0.0444
0.50	-0.0883	-0.0215	-0.0327	-0.0022
0.70	0.0131	-0.0074	0.0108	0.0236
0.80	0.0380	0.0049	0.0471	0.0647
0.90	0.0628	0.0455	0.0859	0.0714

COLL = 8
 TORQUE = 1.12
 PRESS = 14.718

RPM = 400
 CT/S = 0.1925
 TEMP = 64.75

THRUST = 4.75
 CQ/S = 0.0227
 DENSITY = 0.002343

Cpu

r/R x/c	0.125	0.20	0.30
0.06	-1.4032	-0.9129	-1.5430
0.15	-3.4942	-1.9267	-1.6584
0.25	-4.7281	-2.2552	-1.6298
0.35	-3.9359	-1.7702	-1.4408
0.45	-3.0945	-1.5061	-1.2632
0.55	-1.7761	-1.1667	-1.0086
0.65	-1.6629	-0.5545	-0.7441
0.75	-1.1935	-0.2898	-0.3697
0.85	****	-0.1898	-0.2224
0.95	-0.7374	-0.0552	-0.0285

Cpl

r/R x/c	0.125	0.20	0.30
0.10	-0.3930	0.1145	0.0915
0.15	-0.5053	-0.0170	-0.1715
0.30	-0.7126	-0.1929	-0.1953
0.40	****	****	-0.1408
0.50	-0.6396	-0.1823	-0.0927
0.70	-0.5094	-0.0144	-0.0116
0.80	-0.6403	0.0710	-0.0023
0.90	-0.5979	0.0516	0.0398

COLL = 8
 TORQUE = 1.93
 PRESS = 14.718

RPM = 600
 CT/S = 0.1409
 TEMP = 64.66

THRUST = 7.82
 CQ/S = 0.0174
 DENSITY = 0.002343

Cpu

r/R \ x/c	0.125	0.20	0.30
0.06	-1.4635	-1.1502	-1.4548
0.15	-3.4158	-2.1598	-1.7333
0.25	-4.1058	-2.3471	-1.6791
0.35	-4.0444	-1.8291	-1.4956
0.45	-3.0682	-1.5903	-1.2527
0.55	-1.8300	-0.9438	-1.0370
0.65	-1.5501	-0.5485	-0.5962
0.75	-1.4814	-0.3527	-0.3300
0.85	****	-0.2034	-0.1652
0.95	-0.8367	0.0085	-0.0002

Cpl

r/R \ x/c	0.125	0.20	0.30
0.10	-0.2988	0.2600	0.0942
0.15	-0.3206	0.0309	-0.1623
0.30	-0.5923	-0.1339	-0.1980
0.40	****	****	-0.1450
0.50	-0.4513	-0.1196	-0.0815
0.70	-0.5653	0.0294	-0.0063
0.80	-0.6633	0.0791	0.0105
0.90	-0.4885	0.1081	0.0483

COLL = 8
TORQUE = 2.63
PRESS = 14.718

RPM = 800
CT/S = 0.1292
TEMP = 68.66

THRUST = 12.65
CQ/S = 0.0134
DENSITY = 0.002324

Cpu

r/R x/c	0.125	0.20	0.30	0.40
0.06	-1.6303	-1.1863	-1.5897	-1.3187
0.15	-3.4085	-2.1927	-1.7236	-1.3367
0.25	-4.0958	-2.2975	-1.7513	-1.3879
0.35	-4.0132	-1.9788	-1.5482	-1.1673
0.45	-2.7973	-1.7078	-1.3160	-0.9961
0.55	-1.7371	-0.9273	-1.0622	-0.8647
0.65	-1.4780	-0.5257	-0.5557	-0.4865
0.75	-1.3764	-0.3427	-0.3207	-0.2860
0.85	****	-0.1892	-0.1553	-0.1727
0.95	-0.9942	0.0301	0.0326	0.0478

r/R x/c	0.50	0.60	0.70	0.75
0.06	-1.0305	-0.8390	-0.6776	-0.4859
0.15	-1.2554	-1.0207	-0.8585	-0.6375
0.25	-1.1760	-0.9872	-0.8412	-0.8237
0.35	-1.0506	-0.9179	-0.8182	-0.7874
0.45	-0.9223	-0.7958	-0.7203	-0.7003
0.55	-0.7267	-0.7044	-0.6176	-0.5535
0.65	-0.4972	-0.5554	-0.4987	-0.4289
0.75	-0.3587	-0.4004	-0.3425	-0.3318
0.85	-0.2248	-0.2680	-0.2780	-0.2617
0.95	0.0410	0.0067	-0.0342	-0.0428

Cpl

r/R x/c	0.125	0.20	0.30	0.40
0.10	-0.2479	0.2154	0.1015	0.0269
0.15	-0.3227	0.0640	-0.1601	-0.1169
0.30	-0.5767	-0.1267	-0.2022	-0.1085
0.40	****	-0.0511	-0.1577	-0.1653
0.50	-0.5633	-0.1383	-0.0728	-0.0275
0.70	-0.5809	0.0606	-0.0006	0.0434
0.80	-0.6597	0.0941	0.0138	0.0383
0.90	-0.5353	0.1047	0.0549	0.0802

r/R x/c	0.50	0.60	0.70	0.75
0.10	0.0817	-0.1168	-0.1343	-0.1547
0.15	-0.0326	-0.1096	-0.1258	-0.1064
0.30	-0.1270	-0.0515	-0.0291	-0.0195
0.40	-0.1912	-0.0497	-0.0245	-0.0111
0.50	-0.0073	0.0000	0.0030	0.0056
0.70	0.0616	0.0342	0.0286	0.0282
0.80	0.0527	0.0474	0.0514	0.0408
0.90	0.0992	0.0905	0.0809	0.0662

COLL = 8
TORQUE = 5.13
PRESS = 14.718

RPM = 1200
CT/S = 0.1109
TEMP = 69.49

THRUST = 24.39
CQ/S = 0.0117
DENSITY = 0.002321

Cpu

r/R \ x/c	0.125	0.20	0.30	0.40
0.06	-1.4903	-1.1026	-1.5227	-1.2953
0.15	-3.2669	-2.1207	-1.6602	-1.3254
0.25	-3.9446	-2.3042	-1.7543	-1.4024
0.35	-3.8785	-1.9281	-1.5066	-1.1677
0.45	-2.3780	-1.5893	-1.2661	-0.9993
0.55	-1.6877	-0.8699	-0.9103	-0.7208
0.65	-1.4419	-0.5007	-0.5269	-0.4762
0.75	-1.4092	-0.3586	-0.2983	-0.2715
0.85	****	-0.1694	-0.1365	-0.1391
0.95	-1.1435	0.0302	0.05	0.0664

r/R \ x/c	0.50	0.60	0.70	0.75
0.06	-0.9935	-0.8272	-0.6566	-0.4777
0.15	-1.2161	-1.0117	-0.8564	-0.6379
0.25	-1.1521	-0.9882	-0.8365	-0.8211
0.35	-1.0467	-0.9202	-0.8093	-0.7747
0.45	-0.8695	-0.7906	-0.6965	-0.6858
0.55	-0.6634	-0.6620	-0.5773	-0.5358
0.65	-0.4811	-0.4886	-0.4373	-0.3989
0.75	-0.3386	-0.3923	-0.3441	-0.3180
0.85	-0.2032	-0.2458	-0.2722	-0.2466
0.95	0.0555	0.0364	-0.0272	-0.0349

Cpl

r/R \ x/c	0.125	0.20	0.30	0.40
0.10	-0.3353	0.2024	0.0840	0.0134
0.15	-0.5408	0.0119	-0.1693	-0.1340
0.30	-0.7495	-0.1728	-0.1992	-0.1288
0.40	****	-0.1282	-0.1462	-0.1279
0.50	-0.7595	-0.1709	-0.0807	-0.0406
0.70	-0.5982	0.0537	-0.0105	0.0198
0.80	-0.7493	0.0947	-0.0002	0.0259
0.90	-0.6556	0.1134	0.0653	0.0625

r/R \ x/c	0.50	0.60	0.70	0.75
0.10	0.0817	-0.1176	-0.1293	-0.1530
0.15	-0.0355	-0.1121	-0.1232	-0.1053
0.30	-0.1250	-0.0518	-0.0248	-0.0168
0.40	-0.1353	-0.0416	-0.0176	-0.0042
0.50	-0.0123	0.0009	0.0067	0.0078
0.70	0.0455	0.0309	0.0322	0.0275
0.80	0.0477	0.0414	0.0542	0.0397
0.90	0.0884	0.0775	0.0849	0.0639

COLL = 8
TORQUE = 10.30
PRESS = 14.718

RPM = 1800
CT/S = 0.1014
TEMP = 70.221

THRUST = 50.10
CQ/S = 0.0104
DENSITY = 0.002317

Cpu

r/R \ x/c	0.125	0.20	0.30	0.40
0.06	-1.3527	-0.9199	-1.4796	-1.2605
0.15	-3.2964	-1.8883	-1.6156	-1.2914
0.25	-3.8506	-2.1263	-1.7700	-1.3340
0.35	-3.5295	-1.7517	-1.4969	-1.1459
0.45	-2.1616	-1.4309	-1.2020	-0.8892
0.55	-1.5420	-0.8057	-0.8036	-0.6688
0.65	-1.2693	-0.4879	-0.5028	-0.4408
0.75	-1.3715	-0.3498	-0.2680	-0.2181
0.85	****	-0.1876	-0.1231	-0.0719
0.95	-1.0412	0.0065	0.0492	0.081

r/R \ x/c	0.50	0.60	0.70	0.75
0.06	-0.9527	-0.7788	-0.6303	-0.4311
0.15	-1.1605	-0.9531	-0.8539	-0.5683
0.25	-1.0903	-0.9076	-0.8132	-0.8757
0.35	-0.9485	-0.8540	-0.7899	-0.7877
0.45	-0.7170	-0.6747	-0.6755	-0.6353
0.55	-0.6279	-0.5792	-0.5452	-0.4926
0.65	-0.4407	-0.4435	-0.4118	-0.3587
0.75	-0.2923	-0.2846	-0.3245	-0.2787
0.85	-0.1443	-0.1556	-0.2444	-0.2059
0.95	0.0935	0.0270	0.0078	0.0038

Cpl

r/R \ x/c	0.125	0.20	0.30	0.40
0.10	-0.3652	0.0687	0.0603	-0.0018
0.15	-0.6092	-0.1052	-0.1936	-0.1504
0.30	-0.7219	-0.2491	-0.2208	-0.1389
0.40	****	-0.2271	-0.1415	-0.1111
0.50	-0.7150	-0.1994	-0.0921	-0.0510
0.70	-0.4912	0.0180	-0.0227	0.0063
0.80	-0.6454	0.0373	0.0211	0.0142
0.90	-0.6019	0.0763	0.0673	0.0432

r/R \ x/c	0.50	0.60	0.70	0.75
0.10	0.0724	-0.1284	-0.1301	-0.1495
0.15	-0.0416	-0.1235	-0.1345	-0.1007
0.30	-0.1317	-0.0569	0.0058	-0.0096
0.40	-0.1152	-0.0380	0.0010	0.0097
0.50	-0.0234	-0.0043	0.0202	0.0559
0.70	0.0434	0.0171	0.0355	0.0478
0.80	0.0460	0.0200	0.0587	0.0846
0.90	0.0707	0.0490	0.0904	0.0731

COLL = 8
 TORQUE = 18.36
 PRESS = 14.718

RPM = 2400
 CT/S = 0.0987
 TEMP = 70.77

THRUST = 86.58
 CQ/S = 0.0105
 DENSITY = 0.002315

Cpu

r/R x/c	0.125	0.20	0.30	0.40
0.06	-1.2922	-0.9100	-1.4038	-1.2046
0.15	-3.3036	-1.8667	-1.5514	-1.2460
0.25	-3.8646	-2.0954	-1.5946	-1.2880
0.35	-3.6220	-1.7655	-1.4074	-1.1269
0.45	-2.2009	-1.2941	-1.1281	-0.8411
0.55	-1.4465	-0.8223	-0.7657	-0.6370
0.65	-1.2117	-0.4896	-0.4811	-0.4168
0.75	-1.2912	-0.3207	-0.2388	-0.1995
0.85	****	-0.1787	-0.1202	-0.0546
0.95	-1.0208	0.0029	0.0385	0.0905

r/R x/c	0.50	0.60	0.70	0.75
0.06	-0.9102	-0.7256	-0.5801	-0.3892
0.15	-1.0970	-0.8988	-0.8082	-0.5781
0.25	-1.0547	-0.8373	-0.7667	-0.8342
0.35	-0.9102	-0.7689	-0.7510	-0.7573
0.45	-0.6789	-0.6592	-0.6351	-0.6113
0.55	-0.5960	-0.5794	-0.5012	-0.4578
0.65	-0.4122	-0.4014	-0.3784	-0.3356
0.75	-0.2557	-0.2424	-0.2888	-0.2458
0.85	-0.0991	-0.0775	-0.2054	-0.1658
0.95	0.1173	0.0611	0.0468	0.0377

Cpl

r/R x/c	0.125	0.20	0.30	0.40
0.10	-0.4582	0.0441	0.0334	-0.0122
0.15	-0.6476	-0.1353	-0.2280	-0.1580
0.30	-0.7360	-0.2762	-0.2328	-0.1429
0.40	-0.7610	-0.2373	-0.1512	-0.1053
0.50	-0.7940	-0.2255	-0.0972	-0.0548
0.70	-0.6155	0.0122	-0.0083	0.0014
0.80	-0.7282	0.0388	0.0306	0.0153
0.90	-0.5821	0.0645	0.0613	0.0372

r/R x/c	0.50	0.60	0.70	0.75
0.10	0.0675	-0.1303	-0.1216	-0.1348
0.15	-0.0496	-0.1224	-0.1420	-0.0873
0.30	-0.1148	-0.0540	0.0244	0.0075
0.40	-0.0651	-0.0343	0.0115	0.0461
0.50	-0.0140	-0.0008	0.0316	0.0724
0.70	0.0475	0.0290	0.0475	0.0648
0.80	0.0529	0.0258	0.0728	0.1008
0.90	0.0644	0.0472	0.0983	0.0858

COLL = 12
TORQUE = 7.17
PRESS = 14.698

RPM = 1200
CT/S = 0.1323
TEMP = 67.45

THRUST = 29.18
CQ/S = 0.0163
DENSITY = 0.002327

Cpu

r/R \ x/c	0.125	0.20	0.30	0.40
0.06	-1.5000	-0.9423	-1.6367	-1.3926
0.15	-3.2663	-2.0101	-1.7645	-1.3834
0.25	-3.9911	-2.2172	-1.8739	-1.4543
0.35	-3.6817	-1.8857	-1.5872	-1.2207
0.45	-2.4034	-1.5207	-1.3145	-1.0000
0.55	-1.5696	-0.8723	-0.9092	-0.7390
0.65	-1.3099	-0.5027	-0.5324	-0.4962
0.75	-1.3116	-0.3885	-0.3152	-0.2881
0.85	****	****	****	****
0.95	-0.951	0.0073	0.053	0.0658

r/R \ x/c	0.50	0.60	0.70	0.75
0.06	-1.1072	****	****	****
0.15	-1.3003	****	****	-0.5237
0.25	-1.2061	-0.7227	-0.5776	-0.6492
0.35	-1.0885	-0.8845	-0.7713	-0.8292
0.45	-0.8280	-0.9767	-0.8442	-0.8263
0.55	-0.6886	-0.8333	-0.7409	-0.6228
0.65	-0.4951	-0.5943	-0.5753	-0.4976
0.75	-0.3610	-0.6203	-0.5701	-0.4554
0.85	****	-0.4262	-0.3658	****
0.95	0.0646	-0.2870	-0.2486	****

Cpl

r/R \ x/c	0.125	0.20	0.30	0.40
0.10	-0.2315	0.1453	0.1168	0.0472
0.15	-0.4918	-0.0013	-0.1441	-0.1039
0.30	-0.6425	-0.2079	-0.1959	-0.1110
0.40	-0.6554	-0.3028	-0.1582	-0.0877
0.50	-0.6406	-0.2020	-0.0729	-0.0303
0.70	-0.3961	0.0570	0.0052	0.0239
0.80	-0.5464	0.0481	0.0106	0.0333
0.90	-0.4889	0.0841	0.0735	0.0702

r/R \ x/c	0.50	0.60	0.70	0.75
0.10	0.1315	****	****	-0.0065
0.15	0.0007	0.1337	0.0825	0.0231
0.30	-0.1010	0.0621	0.0563	0.0012
0.40	-0.0686	****	****	****
0.50	-0.0060	0.0240	0.0517	****
0.70	0.0496	0.0950	0.1015	****
0.80	0.0553	****	****	****
0.90	0.0930	0.0991	0.0939	0.4094

COLL = 12
TORQUE = 15.01
PRESS = 14.698

RPM = 1800
CT/S = 0.1287
TEMP = 67.94

THRUST = 63.78
CQ/S = 0.0151
DENSITY = 0.002325

Cpu

r/R \ x/c	0.125	0.20	0.30	0.40
0.06	-1.4609	-1.0716	-1.5806	-1.2858
0.15	-3.3010	-2.1262	-1.7099	-1.2984
0.25	-4.0575	-2.3222	-1.7874	-1.3172
0.35	-3.6455	-1.9184	-1.5665	-1.1581
0.45	-2.1855	-1.4085	-1.2439	-0.8952
0.55	-1.4635	-0.8528	-0.8483	-0.6806
0.65	-1.2313	-0.5113	-0.5224	-0.4543
0.75	-1.2887	-0.3701	-0.2960	-0.2529
0.85	****	****	****	****
0.95	-0.9465	0.0479	0.0583	0.0683

r/R \ x/c	0.50	0.60	0.70	0.75
0.06	-1.0046	****	****	****
0.15	-1.1629	****	****	-0.4968
0.25	-1.0859	-0.6864	-0.5370	-0.6338
0.35	-0.9437	-0.8347	-0.7541	-0.7808
0.45	-0.7128	-0.9267	-0.8154	-0.7929
0.55	-0.6238	-0.8168	-0.7191	-0.6016
0.65	-0.4420	-0.5678	-0.5467	-0.4674
0.75	-0.3065	-0.5877	-0.5329	-0.4093
0.85	****	-0.3974	-0.3377	****
0.95	0.0859	-0.2623	-0.2252	****

Cpl

r/R \ x/c	0.125	0.20	0.30	0.40
0.10	-0.2993	0.1753	0.0681	0.0026
0.15	-0.5211	-0.0069	-0.2012	-0.1437
0.30	-0.6541	-0.1678	-0.2371	-0.1304
0.40	-0.7028	-0.2109	-0.1801	-0.1068
0.50	-0.6109	-0.1163	-0.0923	-0.0475
0.70	-0.4421	0.0931	-0.0242	0.0011
0.80	-0.5810	0.0728	0.0288	0.0139
0.90	-0.5656	0.1200	0.0700	0.0459

r/R \ x/c	0.50	0.60	0.70	0.75
0.10	0.1112	****	****	0.0189
0.15	-0.0109	0.1635	0.1197	0.0303
0.30	-0.1079	0.0455	0.0476	0.0079
0.40	-0.0677	****	****	****
0.50	-0.0035	0.0143	0.0781	****
0.70	0.0482	0.0882	0.1228	****
0.80	0.0510	0.2090	0.2964	****
0.90	0.0698	0.0916	0.0992	0.4246

COLL = 16
 TORQUE = 1.59
 PRESS = 14.698

RPM = 400
 CT/S = 0.2440
 TEMP = 70.10

THRUST = 5.95
 CQ/S = 0.0325
 DENSITY = 0.002315

Cpu

r/R \ x/c	0.125	0.20	0.30
0.06	-2.6250	-1.6003	-2.6046
0.15	-4.4136	-2.8923	-2.5312
0.25	-5.1600	-2.9474	-2.1447
0.35	-4.6344	-2.3689	-1.8691
0.45	-3.6251	-1.9854	-1.6418
0.55	-2.3999	-1.1271	-1.1720
0.65	-1.7080	-0.7997	-0.5509
0.75	-1.7034	-0.5630	-0.3366
0.85	-1.4826	-0.4349	-0.2106
0.95	-1.1033	-0.1506	-0.0411

Cpl

r/R \ x/c	0.125	0.20	0.30
0.10	0.1418	0.4434	0.5413
0.15	-0.0694	0.2354	0.2475
0.30	-0.3562	-0.1473	0.0413
0.40	****	****	-0.0505
0.50	-0.4949	-0.1968	0.0205
0.70	-0.3163	-0.0509	0.0507
0.80	-0.5864	-0.0444	0.0340
0.90	-0.5461	0.0112	0.0500

COLL = 16
 TORQUE = 3.23
 PRESS = 14.698

RPM = 600
 CT/S = 0.2423
 TEMP = 70.11

THRUST = 13.29
 CQ/S = 0.0294
 DENSITY = 0.002315

Cpu

r/R x/c	0.125	0.20	0.30
0.06	-2.6938	-2.0966	-2.6194
0.15	-4.6713	-3.0975	-2.4313
0.25	-4.7520	-2.7604	-2.1541
0.35	-4.7590	-2.5520	-1.9141
0.45	-3.1151	-1.9970	-1.6183
0.55	-2.1063	-1.0845	-0.9956
0.65	-1.6882	-0.6881	-0.5788
0.75	-1.7687	-0.5268	-0.3717
0.85	-1.6538	-0.3510	-0.2178
0.95	-1.0414	-0.082	-0.001

Cpl

r/R x/c	0.125	0.20	0.30
0.10	0.2260	0.4717	0.5786
0.15	-0.2303	0.3848	0.3166
0.30	-0.4782	0.0678	0.0637
0.40	****	****	-0.0501
0.50	-0.5054	-0.0061	0.0736
0.70	-0.4013	0.0839	0.0713
0.80	-0.7042	0.0528	0.0474
0.90	-0.5675	0.1065	0.0741

COLL = 16
 TORQUE = 4.79
 PRESS = 14.698

RPM = 800
 CT/S = 0.2267
 TEMP = 70.11

THRUST = 22.11
 CQ/S = 0.0246
 DENSITY = 0.002315

Cpu

r/R \ x/c	0.125	0.20	0.30
0.06	-2.4394	-1.9866	-2.4972
0.15	-4.4338	-2.7741	-2.2889
0.25	-5.3673	-2.7349	-2.1661
0.35	-4.9304	-2.4983	-1.8123
0.45	-3.2322	-1.7404	-1.5022
0.55	-2.0817	-1.0022	-0.9375
0.65	-1.7370	-0.6468	-0.5696
0.75	-1.6555	-0.5102	-0.3616
0.85	-1.5644	-0.3304	-0.2096
0.95	-1.0449	-0.0251	-0.0158

Cpl

r/R \ x/c	0.125	0.20	0.30
0.10	-0.0286	0.5160	0.5263
0.15	-0.3447	0.3621	0.2674
0.30	-0.5667	0.0730	0.0645
0.40	****	****	-0.0384
0.50	-0.5499	0.0027	0.0544
0.70	-0.4803	0.0858	0.0633
0.80	-0.6783	0.0682	0.0572
0.90	-0.5899	0.1157	0.0907

COLL = 16
TORQUE = 10.54
PRESS = 14.698

RPM = 1200
CT/S = 0.1802
TEMP = 69.26

THRUST = 39.61
CQ/S = 0.0240
DENSITY = 0.002319

Cpu

r/R \ x/c	0.125	0.20	0.30	0.40
0.06	-2.3016	-1.8317	-2.5159	-2.1910
0.15	-4.4494	-2.8923	-2.3652	-1.8727
0.25	-5.1567	-2.9293	-2.2399	-1.7356
0.35	-4.6550	-2.4429	-1.8422	-1.4903
0.45	-3.1012	-1.8071	-1.6287	-1.0437
0.55	-2.0692	-1.0461	-0.9274	-0.7471
0.65	-1.7017	-0.6625	-0.5774	-0.5024
0.75	-1.6668	-0.5141	-0.3380	-0.2769
0.85	-1.6097	-0.3074	-0.1701	-0.1323
0.95	-1.5929	-0.0494	0.0151	0.0114

r/R \ x/c	0.50	0.60	0.70	0.75
0.06	-1.9424	-1.7203	-1.5756	-1.5365
0.15	-1.7418	-1.5698	-1.4338	-1.1920
0.25	-1.4995	-1.3488	-1.2148	-1.1652
0.35	-1.3305	-1.1481	-1.0770	-1.0583
0.45	-0.8279	-0.8341	-0.8487	-0.8397
0.55	-0.7151	-0.6719	-0.6461	-0.6284
0.65	-0.4896	-0.5084	-0.4815	-0.4405
0.75	-0.3119	-0.3634	-0.3619	-0.3383
0.85	-0.1304	-0.1623	-0.2207	-0.2201
0.95	0.0453	0.0530	0.0227	-0.0206

Cpl

r/R \ x/c	0.125	0.20	0.30	0.40
0.10	-0.3278	0.4316	0.4930	0.4192
0.15	-0.7074	0.2839	0.2335	0.2390
0.30	-0.9577	0.0122	0.0590	0.0935
0.40	-1.0671	-0.1435	0.0061	0.0608
0.50	-0.8262	-0.0094	0.0573	0.0853
0.70	-0.5867	0.0640	0.0835	0.0724
0.80	-0.7269	0.0461	0.0611	0.0535
0.90	-0.7093	0.0778	0.0846	0.0530

r/R \ x/c	0.50	0.60	0.70	0.75
0.10	0.5025	0.3834	0.3683	0.3638
0.15	0.3354	0.2852	0.2917	0.3037
0.30	0.1238	0.1820	0.2116	0.2204
0.40	0.0853	0.1343	0.1580	0.1638
0.50	0.1136	0.1374	0.1459	0.1487
0.70	0.0998	0.0891	0.0974	0.1035
0.80	0.0787	0.0632	0.0848	0.0796
0.90	0.0739	0.0657	0.0809	0.0731

COLL = 16
TORQUE = 23.25
PRESS = 14.698

RPM = 1800
CT/S = 0.1728
TEMP = 69.60

THRUST = 85.40
CQ/S = 0.0235
DENSITY = 0.002317

Cpu

r/R \ x/c	0.125	0.20	0.30	0.40
0.06	-2.2776	-1.6851	-2.3326	-2.1327
0.15	-4.4835	-2.7131	-2.1732	-1.8110
0.25	-4.7947	-2.8064	-2.0942	-1.6705
0.35	-4.3517	-2.3235	-1.7497	-1.4022
0.45	-2.8531	-1.6832	-1.3491	-1.0034
0.55	-1.9663	-1.0669	-0.8945	-0.7371
0.65	-1.6042	-0.6675	-0.5661	-0.4696
0.75	-1.6688	-0.5226	-0.3541	-0.2508
0.85	-1.6480	-0.2932	-0.1865	-0.1311
0.95	-1.1842	-0.0416	0.0061	-0.0039

r/R \ x/c	0.50	0.60	0.70	0.75
0.06	-1.9167	-1.6711	-1.5295	-1.4729
0.15	-1.6982	-1.5075	-1.4202	****
0.25	-1.4459	-1.2969	-1.1782	-1.3362
0.35	-1.1718	-1.1142	-1.0469	-1.0393
0.45	-0.8247	-0.8061	-0.8176	-0.7948
0.55	-0.6923	-0.6541	-0.6303	-0.5974
0.65	-0.4629	-0.4780	-0.4637	-0.4178
0.75	-0.2769	-0.3238	-0.3408	-0.3194
0.85	-0.1056	-0.1359	-0.1954	-0.1965
0.95	0.0308	0.0390	0.0406	0.0095

Cpl

r/R \ x/c	0.125	0.20	0.30	0.40
0.10	-0.3608	0.3894	0.4363	0.4235
0.15	-0.8831	0.1738	0.1716	0.2393
0.30	-0.9756	-0.0806	0.0144	0.0964
0.40	-0.9970	-0.1703	-0.0062	0.0696
0.50	-0.8467	-0.1205	0.0262	0.0840
0.70	-0.6535	0.0350	0.0512	0.0701
0.80	-0.6891	0.0238	0.0347	0.0486
0.90	-0.6577	0.0496	0.0527	0.0424

r/R \ x/c	0.50	0.60	0.70	0.75
0.10	0.4894	0.3773	0.3697	0.3699
0.15	0.3283	0.2838	0.2886	0.3097
0.30	0.1215	0.1839	0.2173	0.2271
0.40	0.0822	0.1396	0.1628	0.1774
0.50	0.1123	0.1408	0.1530	0.1691
0.70	0.0996	0.0908	0.1018	0.1176
0.80	0.0735	0.0621	0.0910	0.0919
0.90	0.0611	0.0617	0.0846	0.0838

COLL = 18
TORQUE = 11.94
PRESS = 14.698

RPM = 1200
CT/S = 0.1837
TEMP = 66.03

THRUST = 40.64
CQ/S = 0.0270
DENSITY = 0.002334

Cpu

r/R \ x/c	0.125	0.20	0.30	0.40
0.06	-2.2234	-1.7439	-2.5917	-2.3928
0.15	-4.2827	-2.8431	-2.3678	-2.0285
0.25	-5.1471	-2.9108	-2.2262	-1.8349
0.35	-5.0010	-2.3434	-1.8286	-1.5501
0.45	-3.1959	-1.7232	-1.5686	-1.0781
0.55	-2.1572	-1.0379	-0.9021	-0.7646
0.65	-1.8862	-0.6840	-0.5656	-0.4813
0.75	-1.8852	-0.5422	-0.3477	-0.2479
0.85	****	****	****	****
0.95	-1.4854	-0.0873	-0.0009	0.0025

r/R \ x/c	0.50	0.60	0.70	0.75
0.06	-2.0625	-1.8279	-1.3765	-1.7173
0.15	-1.8020	-1.6299	-1.1859	-1.4085
0.25	-1.5292	-1.3571	-0.9684	-1.2229
0.35	-1.3113	-1.1626	-0.8166	-1.0666
0.45	-0.8292	-0.8386	-0.5981	-0.8641
0.55	-0.7022	-0.6772	-0.4283	-0.6293
0.65	-0.4768	-0.5019	-0.2733	-0.4473
0.75	-0.2875	-0.3326	-0.1573	-0.3308
0.85	****	****	****	****
0.95	0.0315	0.0376	0.1286	-0.0157

Cpl

r/R \ x/c	0.125	0.20	0.30	0.40
0.10	-0.4247	0.4515	0.5287	0.5056
0.15	-0.7575	0.2084	0.2609	0.3025
0.30	-1.0507	-0.0718	0.0710	0.1343
0.40	****	-0.1598	0.0339	0.0943
0.50	-0.9425	-0.0871	0.0593	0.1055
0.70	-0.7479	0.0152	0.0769	0.0829
0.80	-0.9407	0.0123	0.0589	0.0580
0.90	-0.8529	0.0573	0.0839	0.0514

r/R \ x/c	0.50	0.60	0.70	0.75
0.10	0.5477	0.4361	0.4942	0.4370
0.15	0.3752	0.3341	0.4206	0.3619
0.30	0.1494	0.2113	0.3347	0.2555
0.40	0.1084	0.1598	0.2787	0.1980
0.50	0.1218	0.1548	0.2664	0.1673
0.70	0.1058	0.1000	0.2125	0.1099
0.80	0.0740	0.0668	0.1919	0.0797
0.90	0.0611	0.0561	0.1780	0.0626

COLL = 18
TORQUE = 26.52
PRESS = 14.698

RPM = 1800
CT/S = 0.1819
TEMP = 66.22

THRUST = 90.49
CQ/S = 0.0267
DENSITY = 0.002333

Cpu

r/R \ x/c	0.125	0.20	0.30	0.40
0.06	-2.3768	-1.6261	-2.4637	-2.2608
0.15	-4.7266	-2.6896	-2.2460	-1.9148
0.25	-5.2469	-2.7745	-2.1562	-1.7469
0.35	-5.0048	-2.2761	-1.8058	-1.4455
0.45	-3.0766	-1.6676	-1.3885	-1.0235
0.55	-2.2707	-1.1071	-0.9229	-0.7408
0.65	-1.8784	-0.7270	-0.5862	-0.4747
0.75	-2.0029	-0.5722	-0.3576	-0.2482
0.85	****	****	****	****
0.95	-1.7204	-0.0733	-0.007	-0.0131

r/R \ x/c	0.50	0.60	0.70	0.75
0.06	-2.0789	-1.7662	-1.6581	-1.6649
0.15	-1.7582	-1.5136	-1.4786	-1.3668
0.25	-1.4947	-1.3138	-1.2169	-1.2011
0.35	-1.1994	-1.0924	-1.0369	-1.0439
0.45	-0.8521	-0.8046	-0.8070	-0.8304
0.55	-0.7060	-0.6442	-0.6063	-0.5971
0.65	-0.4627	-0.4640	-0.4304	-0.4092
0.75	-0.2564	-0.2925	-0.2929	-0.2826
0.85	****	****	****	****
0.95	0.0182	0.0241	-0.0045	-0.0143

Cpl

r/R \ x/c	0.125	0.20	0.30	0.40
0.10	-0.7098	0.2819	0.4473	0.4576
0.15	-0.8852	0.1269	0.1899	0.2673
0.30	-1.1383	-0.1513	0.0148	0.1133
0.40	****	-0.2669	-0.0014	0.0772
0.50	-0.9816	-0.1456	0.0314	0.0949
0.70	-0.7856	0.0057	0.0413	0.0698
0.80	-0.9964	-0.0070	0.0296	0.0482
0.90	-0.7569	0.0432	0.0583	0.0432

r/R \ x/c	0.50	0.60	0.70	0.75
0.10	0.5409	0.4283	0.4285	0.4342
0.15	0.3680	0.3277	0.3369	0.3580
0.30	0.1438	0.2097	0.2429	0.2579
0.40	0.1003	0.1604	0.1844	0.2053
0.50	0.1208	0.1560	0.1634	0.1771
0.70	0.1048	0.0998	0.0985	0.1188
0.80	0.0677	0.0655	0.0759	0.0848
0.90	0.0559	0.0554	0.0563	0.0632

COLL = 20
 TORQUE = 2.17
 PRESS = 14.698

RPM = 400
 CT/S = 0.3254
 TEMP = 66.68

THRUST = 7.98
 CQ/S = 0.0442
 DENSITY = 0.002330

Cpu

r/R \ x/c	0.125	0.20	0.30
0.06	-3.2819	-2.2613	-2.9456
0.15	-5.2095	-3.2837	-2.4497
0.25	-5.6305	-2.8625	-2.1311
0.35	-5.2863	-2.4984	-1.8740
0.45	-3.9100	-2.2153	-1.5760
0.55	-2.6437	-1.1049	-0.8412
0.65	-2.3306	-0.7072	-0.5622
0.75	-1.9905	-0.5057	-0.3494
0.85	-1.9596	-0.3346	-0.2395
0.95	-1.2268	-0.0801	-0.0981

Cpl

r/R \ x/c	0.125	0.20	0.30
0.10	0.0313	0.6600	0.7195
0.15	-0.0285	0.5049	0.4269
0.30	-0.5234	0.1668	0.1901
0.40	****	****	0.3141
0.50	-0.5691	0.0600	0.0981
0.70	-0.6183	0.1105	0.0864
0.80	-0.7760	0.1057	0.0743
0.90	-0.5754	0.1188	0.0555

COLL = 20
 TORQUE = 3.96
 PRESS = 14.698

RPM = 600
 CT/S = 0.2585
 TEMP = 67.45

THRUST = 14.25
 CQ/S = 0.0359
 DENSITY = 0.002327

Cpu

r/R x/c	0.125	0.20	0.30
0.06	-3.2252	-2.3223	-3.0178
0.15	-5.1825	-3.0449	-2.5849
0.25	-5.2408	-3.0532	-2.1832
0.35	-5.6054	-2.4626	-1.9460
0.45	-4.2232	-2.1750	-1.4602
0.55	-2.4235	-1.1158	-0.8348
0.65	-2.1029	-0.7611	-0.5327
0.75	-2.1264	-0.5236	-0.3530
0.85	-2.0216	-0.3674	-0.2346
0.95	-1.2244	-0.0972	-0.0534

Cpl

r/R x/c	0.125	0.20	0.30
0.10	-0.2235	0.6788	0.7107
0.15	-0.2461	0.4589	0.4689
0.30	-0.7591	0.1417	0.2136
0.40	****	****	0.2335
0.50	-0.7254	0.0423	0.1542
0.70	-0.8284	0.0765	0.0963
0.80	-0.9816	0.1187	0.0844
0.90	-0.7105	0.1145	0.0574

COLL = 20
 TORQUE = 6.61
 PRESS = 14.698

RPM = 800
 CT/S = 0.2266
 TEMP = 66.84

THRUST = 22.22
 CQ/S = 0.0337
 DENSITY = 0.002327

Cpu

r/R \ x/c	0.125	0.20	0.30
0.06	-3.0752	-2.1058	-2.9867
0.15	-4.8827	-2.7659	-2.5870
0.25	-5.3279	-2.9065	-2.1197
0.35	-5.4354	-2.5008	-1.8331
0.45	-3.7319	-1.7742	-1.5616
0.55	-2.5149	-1.0148	-0.8788
0.65	-2.0684	-0.7310	-0.5315
0.75	-2.2710	-0.5494	-0.3417
0.85	-2.1006	-0.3954	-0.1970
0.95	-1.1953	-0.1196	-0.0092

Cpl

r/R \ x/c	0.125	0.20	0.30
0.10	-0.0703	0.4952	0.6623
0.15	-0.2497	0.2954	0.4091
0.30	-0.8209	0.0155	0.1663
0.40	****	****	0.1687
0.50	-0.9791	-0.0062	0.1165
0.70	-0.9270	0.0041	0.0902
0.80	-1.0748	0.0140	0.0676
0.90	-0.8538	0.0606	0.0674

COLL = 20
TORQUE = 13.87
PRESS = 14.698

RPM = 1200
CT/S = 0.2053
TEMP = 67.29

THRUST = 45.28
CQ/S = 0.0315
DENSITY = 0.002327

Cpu

r/R \ x/c	0.125	0.20	0.30	0.40
0.06	-2.9816	-1.8904	-2.9723	-2.7079
0.15	-5.0709	-2.9141	-2.5718	-2.1651
0.25	-5.6406	-2.9349	-2.2934	-1.8715
0.35	-5.4818	-2.4635	-1.9017	-1.4872
0.45	-3.3905	-2.0151	-1.4816	-1.0239
0.55	-2.3896	-1.1231	-0.8901	-0.7249
0.65	-2.0124	-0.7688	-0.5642	-0.4386
0.75	-2.0617	-0.5857	-0.3454	-0.2400
0.85	-2.0259	-0.4118	-0.1949	-0.1520
0.95	-1.3246	-0.1333	-0.0156	-0.0216

r/R \ x/c	0.50	0.60	0.70	0.75
0.06	-2.4664	-2.2417	-1.9513	-1.8776
0.15	-1.9802	-1.7736	-1.6621	-1.4169
0.25	-1.6783	-1.3776	-1.3055	-1.2571
0.35	-1.1968	-1.2394	-1.0782	-1.0567
0.45	-0.8437	-0.8503	-0.8032	-0.7826
0.55	-0.6729	-0.6119	-0.5668	-0.5497
0.65	-0.4233	-0.4259	-0.3745	-0.3664
0.75	-0.2338	-0.3099	-0.2564	-0.2825
0.85	-0.1259	-0.2622	-0.2214	-0.2433
0.95	-0.0016	-0.1139	-0.0991	-0.0923

Cpl

r/R \ x/c	0.125	0.20	0.30	0.40
0.10	-0.2797	0.4365	0.6229	0.6187
0.15	-0.5150	0.2287	0.3765	0.4245
0.30	-0.9332	-0.0956	0.1564	0.2149
0.40	****	-0.1411	0.1305	0.1655
0.50	-0.8449	-0.1628	0.0952	0.1528
0.70	-0.7863	-0.0546	0.0793	0.0950
0.80	-0.9602	-0.0576	0.0612	0.0567
0.90	-0.7558	-0.0049	0.0616	0.0332

r/R \ x/c	0.50	0.60	0.70	0.75
0.10	0.6614	0.5950	0.5722	0.5735
0.15	0.4933	0.4651	0.4745	0.4798
0.30	0.2398	0.2946	0.3188	0.3304
0.40	0.1802	0.2319	0.2406	0.2589
0.50	0.1698	0.2004	0.1994	0.2088
0.70	0.1200	0.1035	0.1016	0.1165
0.80	0.0780	0.0518	0.0620	0.0705
0.90	0.0441	0.0018	0.0135	0.0269

COLL = 20
TORQUE = 30.84
PRESS = 14.698

RPM = 1800
CT/S = 0.1973
TEMP = 67.19

THRUST = 97.97
CQ/S = 0.0311
DENSITY = 0.002328

Cpu

r/R \ x/c	0.125	0.20	0.30	0.40
0.06	-2.9209	-2.0870	-2.7986	-2.5445
0.15	-5.5029	-3.0113	-2.4374	-2.0293
0.25	-5.7464	-3.0585	-2.2562	-1.7796
0.35	-5.4184	-2.4993	-1.8818	-1.4094
0.45	-3.3753	-1.7058	-1.3530	-1.0068
0.55	-2.3998	-1.1408	-0.9060	-0.7074
0.65	-1.9427	-0.7478	-0.5787	-0.4310
0.75	-1.9612	-0.5874	-0.3749	-0.2424
0.85	-1.9609	-0.3749	-0.2098	-0.1603
0.95	-1.3248	-0.088	-0.0055	-0.033

r/R \ x/c	0.50	0.60	0.70	0.75
0.06	-2.4647	-1.9817	-1.9037	-1.9311
0.15	-1.9248	-1.4718	-1.6283	-1.3818
0.25	-1.5629	-1.1676	-1.2636	-1.3630
0.35	-1.1931	-1.1348	-1.0526	-1.0093
0.45	-0.8396	-0.7386	-0.7780	-0.7250
0.55	-0.6625	-0.5640	-0.5483	-0.5109
0.65	-0.4077	-0.4131	-0.3568	-0.3460
0.75	-0.2318	-0.3262	-0.2408	-0.2673
0.85	-0.1409	-0.2255	-0.2072	-0.2118
0.95	-0.0190	-0.0664	-0.0826	-0.0759

Cpl

r/R \ x/c	0.125	0.20	0.30	0.40
0.10	-0.3708	0.4493	0.5519	0.5839
0.15	-0.6873	0.2621	0.3275	0.3991
0.30	-1.0408	-0.0513	0.1215	0.2020
0.40	****	-0.1508	0.0972	0.1506
0.50	-0.9282	-0.1156	0.0827	0.1464
0.70	-0.9191	-0.0138	0.0746	0.0939
0.80	-1.0680	-0.0157	0.0601	0.0546
0.90	-0.8730	0.0330	0.0629	0.0273

r/R \ x/c	0.50	0.60	0.70	0.75
0.10	0.6392	0.5806	0.5667	0.5747
0.15	0.4760	0.4545	0.4704	0.4828
0.30	0.2298	0.2893	0.3200	0.3348
0.40	0.1722	0.2262	0.2418	0.2632
0.50	0.1666	0.1979	0.2032	0.2176
0.70	0.1184	0.1063	0.1063	0.1288
0.80	0.0741	0.0551	0.0715	0.0812
0.90	0.0387	0.0106	0.0261	0.0356

COLL = 22
TORQUE = 14.20
PRESS = 14.698

RPM = 1200
CT/S = 0.2000
TEMP = 70.26

THRUST = 43.85
CQ/S = 0.0324
DENSITY = 0.002313

Cpu

r/R \ x/c	0.125	0.20	0.30	0.40
0.06	-3.0537	-2.0993	-2.8021	-2.8714
0.15	-5.1179	-2.8878	-2.4114	-2.2721
0.25	-5.7857	-2.8875	-2.1797	-1.9428
0.35	-5.1226	-2.3504	-1.8294	-1.5252
0.45	-2.1798	****	-1.6483	-0.9436
0.55	-2.2179	-1.1226	-0.8865	-0.7402
0.65	-1.9222	-0.7528	-0.5817	-0.4486
0.75	-1.9219	-0.6098	-0.3731	-0.2656
0.85	****	****	****	****
0.95	****	****	-0.2711	-0.1493

r/R \ x/c	0.50	0.60	0.70	0.75
0.06	-2.6362	-2.2283	-2.0094	-2.0362
0.15	-2.0934	-1.8442	-1.7134	-1.6167
0.25	-1.6867	-1.4633	-1.3200	-1.3126
0.35	-1.2198	-1.1700	-1.0617	-1.0587
0.45	-0.8642	-0.8328	-0.7727	-0.7821
0.55	-0.6787	-0.6040	-0.5351	-0.5200
0.65	-0.4201	-0.3842	-0.3623	-0.3561
0.75	-0.2426	-0.2755	-0.2754	-0.2871
0.85	****	****	****	****
0.95	-0.0650	-0.1450	-0.1269	-0.1675

Cpl

r/R \ x/c	0.125	0.20	0.30	0.40
0.10	0.4004	-0.2239	0.5645	0.7140
0.15	-0.3984	-0.4920	0.4107	0.4677
0.30	-0.9726	-0.0408	0.1428	0.2286
0.40	-1.0791	-0.1491	0.0560	0.1371
0.50	-0.8698	-0.0958	0.0746	0.1473
0.70	-0.7762	-0.0070	0.0622	0.0850
0.80	-0.9189	-0.0324	0.0339	0.0424
0.90	-0.8471	-0.0113	0.0509	0.0144

r/R \ x/c	0.50	0.60	0.70	0.75
0.10	0.8915	0.6426	0.6068	0.6230
0.15	0.5396	0.5088	0.5033	0.5205
0.30	0.2605	0.3197	0.3380	0.3553
0.40	0.2020	0.2365	0.2465	0.2754
0.50	0.1759	0.2070	0.2045	0.2147
0.70	0.1170	0.1010	0.0977	0.1135
0.80	0.0683	0.0368	0.0508	0.0595
0.90	0.0289	-0.0197	-0.0034	0.0062

COLL = 22
TORQUE = 31.82
PRESS = 14.698

RPM = 1800
CT/S = 0.1988
TEMP = 71.46

THRUST = 97.86
CQ/S = 0.0323
DENSITY = 0.002308

Cpu

r/R \ x/c	0.125	0.20	0.30	0.40
0.06	-3.2507	-2.2141	-2.9860	-2.7726
0.15	-5.6306	-3.1207	-2.5783	-2.2000
0.25	-6.0620	-3.1707	-2.3510	-1.8609
0.35	-4.9707	-2.5138	-1.9396	-1.4561
0.45	-4.2295	****	-1.7406	-1.0114
0.55	-2.2737	-1.1318	-0.9118	-0.7194
0.65	-1.9822	-0.7095	-0.5788	-0.4355
0.75	-1.9312	-0.5789	-0.3840	-0.2589
0.85	****	****	****	****
0.95	****	****	-0.5304	-0.1902

r/R \ x/c	0.50	0.60	0.70	0.75
0.06	-2.6203	-2.1410	-1.9929	-2.0747
0.15	-2.0061	-1.7698	-1.6713	-1.5594
0.25	-1.5946	-1.4144	-1.2788	-1.2661
0.35	-1.2169	-1.1284	-1.0278	-1.0180
0.45	-0.8528	-0.8014	-0.7447	-0.7385
0.55	-0.6603	-0.5794	-0.5088	-0.4889
0.65	-0.4085	-0.3630	-0.3400	-0.3405
0.75	-0.2461	-0.2749	-0.2593	-0.2879
0.85	****	****	****	****
0.95	-0.0756	-0.1473	-0.1098	-0.1599

Cpl

r/R \ x/c	0.125	0.20	0.30	0.40
0.10	-1.0936	-0.6218	0.3280	0.6475
0.15	-1.4008	-0.7345	0.1536	0.4554
0.30	-0.9225	-0.0180	0.1478	0.2252
0.40	-0.9969	-0.1142	0.1033	0.1521
0.50	-0.9276	-0.0855	0.0946	0.1488
0.70	-0.6996	0.0293	0.0824	0.0862
0.80	-0.9388	0.0175	0.0678	0.0383
0.90	-0.9116	-0.0110	0.0560	0.0098

r/R \ x/c	0.50	0.60	0.70	0.75
0.10	0.7804	0.6154	0.6044	0.6123
0.15	0.6052	0.4862	0.5014	0.5111
0.30	0.2541	0.3118	0.3404	0.3563
0.40	0.1900	0.2360	0.2569	0.2802
0.50	0.1763	0.2069	0.2142	0.2256
0.70	0.1174	0.1055	0.1089	0.1287
0.80	0.0688	0.0413	0.0679	0.0703
0.90	0.0302	-0.0093	0.0170	0.0220

COLL = 25
 TORQUE = 2.63
 PRESS = 14.698

RPM = 400
 CT/S = 0.3207
 TEMP = 67.43

THRUST = 7.86
 CQ/S = 0.0535
 DENSITY = 0.002328

Cpu

r/R \ x/c	0.125	0.20	0.30
0.06	-3.7423	-3.0461	-3.5945
0.15	-6.7692	-3.6783	-2.9435
0.25	-6.7033	-3.4583	-2.2796
0.35	-5.7704	-2.8452	-2.2156
0.45	-4.9760	-2.4168	-1.4490
0.55	-2.4503	-1.3635	-0.9706
0.65	-2.1170	-0.9448	-0.7307
0.75	-1.9477	-0.8055	-0.6148
0.85	****	-0.6151	-0.4773
0.95	-1.5626	-0.24	-0.2713

Cpl

r/R \ x/c	0.125	0.20	0.30
0.10	0.0845	0.7606	0.8922
0.15	-0.0161	0.4794	0.5987
0.30	-0.8004	0.0584	0.2537
0.40	****	-0.2604	0.1156
0.50	-0.9753	-0.1313	0.0929
0.70	-0.8950	0.0043	0.0647
0.80	-0.9202	-0.0890	-0.0158
0.90	-0.8866	-0.0277	-0.0591

COLL = 25
 TORQUE = 5.47
 PRESS = 14.698

RPM = 600
 CT/S = 0.2569
 TEMP = 67.23

THRUST = 14.16
 CQ/S = 0.0496
 DENSITY = 0.002327

Cpu

r/R x/c	0.125	0.20	0.30
0.06	-3.8633	-2.7692	-3.4364
0.15	-6.5687	-3.7596	-2.8380
0.25	-6.6874	-3.3560	-2.2841
0.35	-5.9763	-2.9094	-2.1779
0.45	-4.3471	-2.1245	-1.5005
0.55	-2.4450	-1.2241	-0.8977
0.65	-2.0250	-0.9158	-0.6033
0.75	-2.1215	-0.7828	-0.4666
0.85	-2.1372	-0.5591	-0.3038
0.95	-1.6892	-0.2643	-0.1058

Cpl

r/R x/c	0.125	0.20	0.30
0.10	0.1630	0.5718	0.7223
0.15	-0.2001	0.4139	0.5067
0.30	-0.8561	0.0138	0.2185
0.40	****	-0.3096	0.0819
0.50	-0.9575	-0.1329	0.0965
0.70	-0.8903	-0.0417	0.0524
0.80	-1.0800	-0.0527	0.0104
0.90	-1.0987	-0.0377	-0.0063

COLL = 25
 TORQUE = 9.01
 PRESS = 14.698

RPM = 800
 CT/S = 0.2417
 TEMP = 67.83

THRUST = 23.69
 CQ/S = 0.0460
 DENSITY = 0.002326

Cpu

r/R \ x/c	0.125	0.20	0.30
0.06	-3.2875	-2.9454	-3.5641
0.15	-6.4025	-3.7855	-2.9780
0.25	-7.3313	-3.3927	-2.4447
0.35	-5.5067	-2.9208	-2.2677
0.45	-4.2280	-1.9969	-1.4597
0.55	-2.5318	-1.2271	-0.9218
0.65	-2.1186	-0.8642	-0.6194
0.75	-2.1719	-0.7277	-0.4290
0.85	-2.1692	-0.5243	-0.2873
0.95	-1.7515	-0.2261	-0.1148

Cpl

r/R \ x/c	0.125	0.20	0.30
0.10	0.3076	0.6739	0.7900
0.15	-0.2885	0.4906	0.5562
0.30	-0.8867	0.0248	0.2212
0.40	****	-0.2132	0.1130
0.50	-0.9698	-0.1420	0.1062
0.70	-1.0108	-0.0295	0.0714
0.80	-1.0861	-0.0432	0.0195
0.90	-1.0584	-0.0324	0.0138

COLL = 25
TORQUE = 20.04
PRESS = 14.698

RPM = 1200
CT/S = 0.2184
TEMP = 67.04

THRUST = 48.21
CQ/S = 0.0454
DENSITY = 0.002329

Cpu

r/R x/c	0.125	0.20	0.30	0.40
0.06	-3.6218	-2.7227	-3.4004	-3.1723
0.15	-6.3517	-3.7152	-2.8559	-2.4344
0.25	-6.7953	-3.6208	-2.4304	-1.9039
0.35	-6.0069	-2.8591	-2.0949	-1.5016
0.45	-3.9173	-1.9078	-1.4852	-1.0988
0.55	-2.6600	-1.2299	-0.9811	-0.7414
0.65	-2.2551	-0.8500	-0.6328	-0.4623
0.75	-2.2393	-0.7296	-0.4394	-0.3264
0.85	-2.2300	-0.5086	-0.2806	-0.2541
0.95	-1.9549	-0.2773	-0.0955	-0.1067

r/R x/c	0.50	0.60	0.70	0.75
0.06	-3.1570	-2.4556	-2.4197	-2.4564
0.15	-2.1953	-1.9339	-1.8774	-1.7277
0.25	-1.6425	-1.3234	-1.2873	-1.2440
0.35	-1.3105	-0.9339	-1.0569	-0.9869
0.45	-0.9197	-0.7500	-0.7517	-0.8124
0.55	-0.6888	-0.6594	-0.5565	-0.6696
0.65	-0.4753	-0.5144	-0.4642	-0.6149
0.75	-0.3579	-0.3957	-0.4429	-0.5568
0.85	-0.2831	-0.4014	-0.4152	-0.5018
0.95	-0.0718	-0.2039	-0.2121	-0.3117

Cpl

r/R x/c	0.125	0.20	0.30	0.40
0.10	-0.3636	0.5103	0.7085	0.7140
0.15	-0.9484	0.2985	0.4609	0.5354
0.30	-1.4608	-0.1055	0.1850	0.2812
0.40	****	-0.2911	0.0889	0.1964
0.50	-1.4802	-0.2026	0.0825	0.1690
0.70	-1.2610	-0.1253	0.0436	0.0802
0.80	-1.3470	-0.1376	0.0146	0.0287
0.90	-1.3110	-0.1019	0.0066	-0.0199

r/R x/c	0.50	0.60	0.70	0.75
0.10	0.7901	0.7301	0.7156	0.7125
0.15	0.6265	0.5929	0.6053	0.6021
0.30	0.3231	0.3656	0.3878	0.3964
0.40	0.2411	0.2826	0.2922	0.2926
0.50	0.2014	0.2224	0.2186	0.2269
0.70	0.1133	0.0826	0.0716	0.0962
0.80	0.0519	0.0104	0.0119	0.0268
0.90	-0.0053	-0.0751	-0.0726	-0.0531

COLL = 25
TORQUE = 45.06
PRESS = 14.698

RPM = 1800
CT/S = 0.2096
TEMP = 66.89

THRUST = 104.14
CQ/S = 0.0453
DENSITY = 0.002330

Cpu

r/R x/c	0.125	0.20	0.30	0.40
0.06	-3.8106	-2.5734	-3.2559	-3.1775
0.15	-6.8158	-3.4790	-2.7491	-2.4242
0.25	-7.1763	-3.5677	-2.4347	-1.9531
0.35	-6.1655	-2.9317	-2.0019	-1.5578
0.45	-3.7106	-1.9379	-1.4490	-1.0961
0.55	-2.6644	-1.3450	-0.9895	-0.7352
0.65	-2.2339	-0.9116	-0.6620	-0.4632
0.75	-2.2449	-0.7242	-0.4680	-0.3307
0.85	-2.2172	-0.5008	-0.2887	-0.2695
0.95	-1.9652	-0.2563	-0.078	-0.1232

r/R x/c	0.50	0.60	0.70	0.75
0.06	-2.9944	-2.5032	-2.3918	-2.4488
0.15	-2.1235	-1.9363	-1.8395	-1.6795
0.25	-1.6166	-1.4007	-1.2992	-1.2215
0.35	-1.2692	-1.0402	-1.0378	-0.9766
0.45	-0.8925	-0.8384	-0.7259	-0.7469
0.55	-0.6659	-0.6065	-0.5379	-0.6106
0.65	-0.4572	-0.4015	-0.4560	-0.5855
0.75	-0.3502	-0.3073	-0.4137	-0.5197
0.85	-0.2831	-0.3221	-0.3955	-0.4782
0.95	-0.0894	-0.1626	-0.1912	-0.2777

Cpl

r/R x/c	0.125	0.20	0.30	0.40
0.10	-0.0915	0.5687	0.6252	0.6960
0.15	-0.7755	0.3012	0.3941	0.5125
0.30	-1.2677	-0.1230	0.1361	0.2645
0.40	****	-0.2816	0.0660	0.1872
0.50	-1.3400	-0.2439	0.0544	0.1566
0.70	-1.0674	-0.1304	0.0300	0.0740
0.80	-1.2845	-0.1576	0.0104	0.0212
0.90	-1.2747	-0.1080	0.0080	-0.0263

r/R x/c	0.50	0.60	0.70	0.75
0.10	0.7536	0.7237	0.6951	0.6865
0.15	0.5964	0.5836	0.5857	0.5845
0.30	0.3060	0.3649	0.3808	0.3909
0.40	0.2212	0.2851	0.2821	0.3014
0.50	0.1896	0.2301	0.2181	0.2393
0.70	0.1107	0.0943	0.0817	0.1095
0.80	0.0498	0.0208	0.0284	0.0558
0.90	-0.0087	-0.0568	-0.0459	-0.0334

COLL = 26
 TORQUE = 2.82
 PRESS = 14.698

RPM = 400
 CT/S = 0.2343
 TEMP = 67.37

THRUST = 5.74
 CQ/S = 0.0575
 DENSITY = 0.002325

Cpu

r/R \ x/c	0.20	0.30	0.40	0.50
0.06	-3.0943	-3.6899	-3.3215	-3.1640
0.15	-3.8608	-2.9577	-2.6544	-2.3633
0.25	-3.6609	-2.3499	-2.2746	-1.7601
0.35	-2.8410	-2.2030	-1.5816	-1.3027
0.45	-2.5588	-1.5305	-1.0386	-0.9421
0.55	-1.4647	-1.0290	-0.7395	-0.7234
0.65	-1.0498	-0.7192	-0.4873	-0.5206
0.75	-0.8109	-0.6043	-0.3210	-0.3634
0.85	****	****	****	****
0.95	****	0.0367	-0.3229	-0.0511

Cpl

r/R \ x/c	0.20	0.30	0.40	0.50
0.10	****	1.2046	0.6426	0.8489
0.15	0.4621	0.6139	0.6115	0.6490
0.30	0.0369	0.2398	0.3151	0.3350
0.40	****	0.2793	0.4161	0.2903
0.50	-0.2302	0.0983	0.1543	0.1962
0.70	-0.1658	0.0067	0.0451	0.0948
0.80	-0.0754	-0.0274	-0.0098	0.0294
0.90	-0.0108	-0.0838	-0.0852	-0.0368

COLL = 26
 TORQUE = 5.75
 PRESS = 14.698

RPM = 600
 CT/S = 0.2234
 TEMP = 67.53

THRUST = 12.30
 CQ/S = 0.0522
 DENSITY = 0.002324

Cpu

r/R \ x/c	0.20	0.30	0.40	0.50
0.06	-2.8081	-3.6396	-3.3377	-3.3529
0.15	-3.7938	-3.0097	-2.5154	-2.3633
0.25	-3.5018	-2.5320	-2.1716	-1.7307
0.35	-3.0587	-2.2576	-1.5171	-1.3547
0.45	-2.2130	-1.5277	-1.0999	-0.9460
0.55	-1.3231	-0.9258	-0.7189	-0.7174
0.65	-1.0098	-0.6319	-0.4782	-0.5259
0.75	-0.7928	-0.4789	-0.3269	-0.3860
0.85	****	****	****	****
0.95	****	0.1473	-0.1235	-0.0502

Cpl

r/R \ x/c	0.20	0.30	0.40	0.50
0.10	****	1.1495	0.7909	0.9276
0.15	0.3820	0.5342	0.5832	0.6041
0.30	-0.0359	0.2277	0.3041	0.3333
0.40	****	0.2305	0.2966	0.2603
0.50	-0.2003	0.0806	0.1761	0.1966
0.70	-0.1297	0.0230	0.0701	0.1134
0.80	-0.1304	-0.0019	0.0184	0.0346
0.90	-0.0756	-0.0382	-0.0332	-0.0155

COLL = 26
 TORQUE = 9.68
 PRESS = 14.698

RPM = 800
 CT/S = 0.2110
 TEMP = 67.49

THRUST = 20.66
 CQ/S = 0.0495
 DENSITY = 0.002324

Cpu

r/R \ x/c	0.20	0.30	0.40	0.50
0.06	-2.5011	-3.6521	-3.2844	-3.1969
0.15	-3.6676	-3.0699	-2.5831	-2.2447
0.25	-3.5393	-2.5954	-2.0753	-1.7534
0.35	-3.0142	-2.3264	-1.5538	-1.3500
0.45	-2.1204	-1.5212	-1.1089	-0.9334
0.55	-1.3417	-0.9829	-0.7507	-0.7250
0.65	-0.9897	-0.6597	-0.4843	-0.5298
0.75	-0.8310	-0.4446	-0.3285	-0.3885
0.85	****	****	****	****
0.95	****	0.1131	-0.1455	-0.1210

Cpl

r/R \ x/c	0.20	0.30	0.40	0.50
0.10	****	1.1190	0.7866	0.8402
0.15	0.2622	0.5242	0.5340	0.6155
0.30	-0.1664	0.2065	0.2871	0.3310
0.40	-0.1646	0.1893	0.2535	0.2488
0.50	-0.3308	0.0806	0.1599	0.1956
0.70	-0.2007	0.0236	0.0766	0.1006
0.80	-0.2122	-0.0008	0.0164	0.0384
0.90	-0.1393	-0.0126	-0.0366	-0.0193

COLL = 26
TORQUE = 21.25
PRESS = 14.698

RPM = 1200
CT/S = 0.2047
TEMP = 68.21

THRUST = 45.03
CQ/S = 0.0483
DENSITY = 0.002321

Cpu

r/R \ x/c	0.125	0.20	0.30	0.40
0.06	-3.8078	-2.7004	-3.5713	-3.2336
0.15	-6.4366	-3.6589	-2.9509	-2.4596
0.25	-7.0170	-3.4840	-2.5798	-2.0295
0.35	-6.5083	-2.9672	-2.2132	-1.5578
0.45	-4.0814	-2.1024	-1.5349	-1.1200
0.55	-2.9072	-1.3968	-1.0136	-0.7610
0.65	-2.3995	-0.9681	-0.6757	-0.4915
0.75	-2.4530	-0.8108	-0.4753	-0.3447
0.85	****	****	****	****
0.95	****	****	-0.025	-0.2067

r/R \ x/c	0.50	0.60	0.70	0.75
0.06	-3.2841	-2.4166	-2.4528	-2.6348
0.15	-2.2445	-1.9929	-1.8948	-1.7828
0.25	-1.7471	-1.4119	-1.3774	-1.3125
0.35	-1.3221	-1.0330	-1.0457	-0.9825
0.45	-0.9248	-0.7602	-0.7572	-0.7782
0.55	-0.6981	-0.6258	-0.6302	-0.6624
0.65	-0.4952	-0.4905	-0.5512	-0.5792
0.75	-0.3838	-0.4361	-0.5060	-0.5484
0.85	****	****	****	****
0.95	-0.2127	-0.3344	-0.3932	-0.3783

Cpl

r/R \ x/c	0.125	0.20	0.30	0.40
0.10	****	****	0.9060	0.7183
0.15	-0.8975	0.2880	0.4167	0.5230
0.30	-1.5180	-0.1651	0.1474	0.2720
0.40	-1.7516	-0.2555	0.0875	0.2118
0.50	-1.6168	-0.3074	0.0456	0.1544
0.70	-1.4350	-0.2260	0.0145	0.0611
0.80	-1.5475	-0.2255	-0.0138	0.0079
0.90	-1.4720	-0.1569	-0.0159	-0.0337

r/R \ x/c	0.50	0.60	0.70	0.75
0.10	0.7644	0.7521	0.7251	0.7401
0.15	0.6166	0.5954	0.6121	0.6020
0.30	0.3234	0.3712	0.3940	0.3972
0.40	0.2387	0.2751	0.2825	0.2913
0.50	0.1967	0.2195	0.2152	0.2206
0.70	0.1053	0.0771	0.0692	0.0856
0.80	0.0382	-0.0078	-0.0023	0.0128
0.90	-0.0190	-0.0882	-0.0892	-0.0696

COLL = 26
TORQUE = 47.51
PRESS = 14.698

RPM = 1800
CT/S = 0.2049
TEMP = 68.34

THRUST = 101.41
CQ/S = 0.0480
DENSITY = 0.002320

Cpu

r/R \ x/c	0.125	0.20	0.30	0.40
0.06	-3.8059	-2.5321	-3.4569	-3.1115
0.15	-6.9014	-3.4884	-2.9466	-2.3880
0.25	-7.2776	-3.5974	-2.5304	-1.9517
0.35	-6.4596	-3.0106	-2.1389	-1.5268
0.45	-4.1945	-2.1038	-1.5484	-1.0876
0.55	-3.1481	-1.4816	-1.0504	-0.7526
0.65	-2.5446	-1.0395	-0.7123	-0.4890
0.75	-2.5280	-0.8317	-0.5087	-0.3507
0.85	****	****	****	****
0.95	****	****	-0.041	-0.1787

r/R \ x/c	0.50	0.60	0.70	0.75
0.06	-3.0501	-2.4582	-2.4266	-2.5352
0.15	-2.2087	-2.3484	-1.8697	-1.6992
0.25	-1.7224	-1.3800	-1.3541	-1.2890
0.35	-1.2940	-1.0081	-1.0179	-0.9787
0.45	-0.8968	-0.7188	-0.7226	-0.7905
0.55	-0.6825	-0.6066	-0.5720	-0.6519
0.65	-0.4853	-0.4623	-0.4925	-0.6050
0.75	-0.3737	-0.3866	-0.4633	-0.5540
0.85	****	****	****	****
0.95	-0.1972	-0.2930	-0.3625	-0.3737

Cpl

r/R \ x/c	0.125	0.20	0.30	0.40
0.10	****	****	0.8231	0.7212
0.15	-1.2828	0.1586	0.4134	0.4970
0.30	-1.9074	-0.2846	0.1254	0.2502
0.40	-2.0769	-0.4092	0.0739	0.1873
0.50	-1.8376	-0.4311	0.0330	0.1523
0.70	-1.5756	-0.3001	-0.0051	0.0614
0.80	-1.6725	-0.2938	-0.0228	0.0078
0.90	-1.5581	-0.2211	-0.0151	-0.0405

r/R \ x/c	0.50	0.60	0.70	0.75
0.10	0.7618	0.7247	0.7032	0.7086
0.15	0.5995	0.5885	0.6061	0.6008
0.30	0.3123	0.3682	0.3923	0.3994
0.40	0.2256	0.2742	0.2836	0.2988
0.50	0.1964	0.2235	0.2237	0.2333
0.70	0.1053	0.0894	0.0801	0.1041
0.80	0.0373	0.0090	0.0184	0.0465
0.90	-0.0179	-0.0648	-0.0599	-0.0476

COLL = 27
 TORQUE = 2.80
 PRESS = 14.698

RPM = 400
 CT/S = 0.2693
 TEMP = 71.04

THRUST = 6.56
 CQ/S = 0.0575
 DENSITY = 0.002312

Cpu

r/R \ x/c	0.125	0.20	0.30
0.06	-4.3753	-2.4589	-3.7171
0.15	-6.4027	-3.2408	-3.1185
0.25	-7.6102	-3.2221	-2.4255
0.35	-6.3795	-2.9501	-2.4222
0.45	-6.2329	-2.5509	-1.5472
0.55	-3.3161	-1.4834	-1.0674
0.65	-2.7622	-1.0545	-0.7552
0.75	-2.6516	-0.8715	-0.6453
0.85	****	****	****
0.95	****	****	****

Cpl

r/R \ x/c	0.125	0.20	0.30
0.10	-0.4413	0.3833	0.8224
0.15	-0.7734	0.1791	0.5396
0.30	-1.7871	-0.2339	0.1697
0.40	****	****	****
0.50	-1.7608	-0.3185	0.0500
0.70	-1.4387	-0.2355	-0.0232
0.80	-1.6916	-0.2907	-0.0982
0.90	-1.6323	-0.1984	-0.1094

COLL = 27
 TORQUE = 5.82
 PRESS = 14.698

RPM = 600
 CT/S = 0.2413
 TEMP = 71.03

THRUST = 13.22
 CQ/S = 0.0532
 DENSITY = 0.002312

Cpu

r/R x/c	0.125	0.20	0.30
0.06	-4.0721	-3.1063	-3.9956
0.15	-6.5988	-3.7588	-3.2767
0.25	-6.9617	-3.5904	-2.5947
0.35	-6.5102	-3.0855	-2.5324
0.45	-4.9799	-2.0704	-1.6086
0.55	-2.8388	-1.3216	-1.0109
0.65	-2.4685	-1.0739	-0.7057
0.75	-2.4361	-0.8513	-0.5273
0.85	****	****	****
0.95	****	****	****

Cpl

r/R x/c	0.125	0.20	0.30
0.10	-0.3108	0.5681	0.8004
0.15	-0.8463	0.3017	0.5802
0.30	-1.4170	-0.1475	0.2299
0.40	****	****	****
0.50	-1.5921	-0.2721	0.0580
0.70	-1.4572	-0.2087	0.0079
0.80	-1.5849	-0.2020	-0.0542
0.90	-1.5458	-0.1249	-0.0479

COLL = 27
 TORQUE = 10.72
 PRESS = 14.698

RPM = 800
 CT/S = 0.2291
 TEMP = 71.04

THRUST = 22.31
 CQ/S = 0.0550
 DENSITY = 0.002312

Cpu

r/R x/c	0.125	0.20	0.30
0.06	-4.1271	-3.2042	-4.0380
0.15	-7.0080	-4.0351	-3.3070
0.25	-7.2409	-3.5836	-2.7055
0.35	-6.5491	-3.3593	-2.5369
0.45	-4.3346	-2.1437	-1.5822
0.55	-2.8546	-1.3423	-1.0473
0.65	-2.3663	-0.9764	-0.6867
0.75	-2.3476	-0.8114	-0.4794
0.85	-2.6704	****	****
0.95	****	****	****

Cpl

r/R x/c	0.125	0.20	0.30
0.10	0.2914	0.6372	0.8559
0.15	-0.6540	0.4170	0.5681
0.30	-1.2531	-0.0852	0.2092
0.40	****	-0.4536	-0.0795
0.50	-1.2671	-0.2808	0.0643
0.70	-1.2547	-0.1300	0.0090
0.80	-1.3967	-0.1475	-0.0510
0.90	-1.3060	-0.1235	-0.0274

COLL = 27
TORQUE = 23.40
PRESS = 14.698

RPM = 1200
CT/S = 0.2158
TEMP = 70.11

THRUST = 47.36
CQ/S = 0.0533
DENSITY = 0.002316

Cpu

r/R \ x/c	0.125	0.20	0.30	0.50
0.06	-4.4621	-3.1712	-3.9988	-3.2876
0.15	-7.0953	-4.0705	-3.2958	-2.2744
0.25	-7.6170	-3.9610	-2.7995	-1.7771
0.35	-6.6570	-3.4306	-2.3482	-1.3583
0.45	-4.0772	-2.0656	-1.5937	-0.9509
0.55	-2.8671	-1.3848	-1.0566	-0.7295
0.65	-2.4155	-0.9868	-0.7066	-0.5231
0.75	-2.4901	-0.8071	-0.5094	-0.4117
0.85	****	****	****	****
0.95	****	****	****	0.018

r/R \ x/c	0.60	0.70	0.75
0.06	-2.6649	-2.5212	-2.7179
0.15	-2.0877	-1.8754	-1.8516
0.25	-1.5311	-1.3341	-1.3187
0.35	-1.1054	-1.0103	-1.0404
0.45	-0.7973	-0.7961	-0.8259
0.55	-0.6596	-0.6855	-0.7072
0.65	-0.5718	-0.5991	-0.6453
0.75	-0.5310	-0.5506	-0.5809
0.85	****	****	****
0.95	-0.3978	-0.3246	-0.4013

Cpl

r/R \ x/c	0.125	0.20	0.30	0.50
0.10	0.0333	0.6021	0.8095	0.7829
0.15	-0.4214	0.3642	0.5619	0.6207
0.30	-1.1710	-0.1217	0.2262	0.3232
0.40	-1.5414	-0.4198	0.0137	0.2079
0.50	-1.2289	-0.2939	0.0785	0.1859
0.70	-1.1146	-0.1799	0.0380	0.0913
0.80	-1.3986	-0.1937	-0.0183	0.0279
0.90	-1.2650	-0.1285	-0.0124	-0.0297

r/R \ x/c	0.60	0.70	0.75
0.10	0.7591	0.7266	0.7133
0.15	0.6172	0.6188	0.5917
0.30	0.3802	0.3938	****
0.40	0.2844	0.2843	0.2965
0.50	0.2221	0.2066	0.2197
0.70	0.0693	0.0585	0.0808
0.80	-0.0134	-0.0067	0.0076
0.90	-0.1110	-0.0997	-0.0872

COLL = 27
TORQUE = 52.97
PRESS = 14.698

RPM = 1800
CT/S = 0.2108
TEMP = 70.68

THRUST = 103.96
CQ/S = 0.0537
DENSITY = 0.002313

Cpu

r/R \ x/c	0.125	0.20	0.30	0.50
0.06	-4.0025	-2.6362	-3.5917	-3.0335
0.15	-6.8966	-3.6566	-3.0232	-2.2884
0.25	-7.4488	-3.6273	-2.6528	-1.7781
0.35	-6.7425	-3.0988	-2.1771	-1.3282
0.45	-3.9828	-2.0961	-1.5649	-0.9210
0.55	-2.8928	-1.4855	-1.0745	-0.7047
0.65	-2.4521	-1.0370	-0.7276	-0.5099
0.75	-2.4785	-0.8482	-0.5251	-0.4124
0.85	****	****	****	****
0.95	****	-0.2843	-0.0725	-0.1191

r/R \ x/c	0.60	0.70	0.75
0.06	-2.6369	-2.4755	-2.5989
0.15	-2.1001	-1.8481	-1.7042
0.25	-1.4852	-1.3233	-1.2304
0.35	-1.0465	-0.9938	-0.9280
0.45	-0.7573	-0.7594	-0.8069
0.55	-0.6262	-0.6575	-0.7036
0.65	-0.4768	-0.5644	-0.6537
0.75	-0.4330	-0.5188	-0.5807
0.85	****	****	****
0.95	-0.3208	-0.3080	-0.4004

Cpl

r/R \ x/c	0.125	0.20	0.30	0.50
0.10	-0.3184	0.4434	0.6887	0.7932
0.15	-0.8598	0.1542	0.4274	0.6182
0.30	-1.5288	-0.2659	0.1320	0.3217
0.40	-1.6992	-0.4595	0.0072	0.2183
0.50	-1.5473	-0.3873	0.0177	0.1876
0.70	-1.3778	-0.2653	-0.0054	0.0938
0.80	-1.5105	-0.2683	-0.0369	0.0291
0.90	-1.4860	-0.1994	-0.0249	-0.0358

r/R \ x/c	0.60	0.70	0.75
0.10	0.7438	0.7135	0.6680
0.15	0.6031	0.6036	0.5788
0.30	0.3740	0.3861	****
0.40	0.2831	0.2882	0.3004
0.50	0.2256	0.2168	0.2353
0.70	0.0747	0.0679	0.0948
0.80	-0.0019	0.0089	0.0378
0.90	-0.0788	-0.0743	-0.0640

COLL = 28
 TORQUE = 3.37
 PRESS = 14.698

RPM = 400
 CT/S = 0.3250
 TEMP = 69.01

THRUST = 7.94
 CQ/S = 0.0689
 DENSITY = 0.002320

Cpu

r/R x/c	0.125	0.20	0.30
0.06	-4.7902	-3.1285	-3.5914
0.15	-6.5254	-4.0122	-3.0685
0.25	-7.5627	-3.4946	-2.4282
0.35	-6.5493	-3.1331	-2.3158
0.45	-5.9576	-2.6895	-1.5178
0.55	-2.8576	-1.5035	-0.9924
0.65	-2.3172	-1.1930	-0.8149
0.75	-2.2725	-1.0936	-0.6164
0.85	-2.5242	****	****
0.95	-1.905	-0.3344	-0.3135

Cpl

r/R x/c	0.125	0.20	0.30
0.10	0.3874	0.6145	0.7828
0.15	-0.4037	0.4040	0.5240
0.30	-1.0730	-0.0785	0.1958
0.40	****	****	-0.0121
0.50	-1.0790	-0.2168	0.0208
0.70	-1.1659	-0.1260	-0.0314
0.80	-1.4153	-0.1972	-0.0836
0.90	-1.5109	-0.1138	-0.1059

COLL = 28
 TORQUE = 6.93
 PRESS = 14.698

RPM = 600
 CT/S = 0.2617
 TEMP = 69.27

THRUST = 14.38
 CQ/S = 0.0630
 DENSITY = 0.002319

Cpu

r/R \ x/c	0.125	0.20	0.30
0.06	-4.3217	-3.3223	-3.9728
0.15	-6.5552	-4.2478	-3.1644
0.25	-7.3295	-3.6160	-2.6535
0.35	-6.8218	-3.3611	-2.4736
0.45	-5.4290	-2.1865	-1.5494
0.55	-3.0797	-1.3898	-0.9908
0.65	-2.5526	-1.0472	-0.6788
0.75	-2.4833	-0.9786	-0.5288
0.85	-2.5401	****	****
0.95	-1.9646	-0.3110	-0.1848

Cpl

r/R \ x/c	0.125	0.20	0.30
0.10	-0.6033	0.6561	0.8232
0.15	-0.9441	0.4207	0.5757
0.30	-1.7497	-0.0812	0.2191
0.40	****	****	-0.0124
0.50	-1.6050	-0.2808	0.0615
0.70	-1.7449	-0.1409	0.0096
0.80	-1.7921	-0.2274	-0.0515
0.90	-1.6048	-0.1088	-0.0481

COLL = 28
 TORQUE = 11.57
 PRESS = 14.698

RPM = 800
 CT/S = 0.2249
 TEMP = 69.69

THRUST = 21.95
 CQ/S = 0.0593
 DENSITY = 0.002317

Cpu

r/R x/c	0.125	0.20	0.30
0.06	-4.1638	-3.0005	-4.0094
0.15	-6.8906	-4.1002	-3.3658
0.25	-7.1342	-3.7814	-2.9491
0.35	-6.9172	-3.1735	-2.5874
0.45	-5.0519	-2.1139	-1.5684
0.55	-3.0353	-1.4315	-1.0451
0.65	-2.5589	-1.0488	-0.6977
0.75	-2.5522	-0.9083	-0.4995
0.85	-2.5267	-0.5624	-0.2236
0.95	-2.0378	-0.3819	-0.1686

Cpl

r/R x/c	0.125	0.20	0.30
0.10	-0.6173	0.5086	0.9218
0.15	-1.1484	0.2260	0.6659
0.30	-1.8168	-0.2043	0.2718
0.40	****	****	0.0037
0.50	-1.7791	-0.3530	0.0871
0.70	-1.6731	-0.2582	0.0207
0.80	-1.7635	-0.2882	-0.0408
0.90	-1.6578	-0.1950	-0.0472

COLL = 28
TORQUE = 24.96
PRESS = 14.698

RPM = 1200
CT/S = 0.2199
TEMP = 71.64

THRUST = 48.09
CQ/S = 0.0571
DENSITY = 0.002308

Cpu

r/R x/c	0.125	0.20	0.30	0.40
0.06	-3.7127	-2.8422	-3.5705	-3.6120
0.15	-6.7717	-3.8900	-2.9715	-2.7684
0.25	-7.4953	-3.8312	-2.5827	-2.1979
0.35	-7.0658	-3.2209	-2.1656	-1.6766
0.45	-4.7367	-2.2163	-1.5401	-1.1713
0.55	-3.2768	-1.4354	-1.0535	-0.7849
0.65	-2.7054	-1.0237	-0.7129	-0.5165
0.75	-2.6559	-0.8702	-0.5103	-0.3842
0.85	-2.6621	-0.5739	-0.2726	-0.3057
0.95	-2.2721	-0.3683	-0.1318	-0.1877

r/R x/c	0.50	0.60	0.70	0.75
0.06	-3.3440	-2.7921	-2.5749	-2.6428
0.15	-2.3166	-2.1529	-1.8111	-1.8882
0.25	-1.8117	-1.6149	-1.2692	-1.3704
0.35	-1.3747	-1.1644	-1.0088	-1.1125
0.45	-0.9825	-0.8393	-0.8383	-0.8515
0.55	-0.7315	-0.6985	-0.7510	-0.7032
0.65	-0.5440	-0.6123	-0.6776	-0.6401
0.75	-0.4350	-0.5574	-0.6059	-0.5891
0.85	-0.3282	-0.5491	-0.5665	-0.5456
0.95	-0.1606	-0.4133	-0.4044	-0.3930

Cpl

r/R x/c	0.125	0.20	0.30	0.40
0.10	-0.6961	0.5495	0.6846	0.8205
0.15	-1.3917	0.2504	0.4586	0.6266
0.30	-2.0740	-0.2329	0.1681	0.3159
0.40	-2.1931	-0.4900	-0.0049	0.1963
0.50	-1.8871	-0.4027	0.0511	0.1754
0.70	-1.7243	-0.2487	0.0080	0.0571
0.80	-1.7850	-0.2884	-0.0387	-0.0051
0.90	-1.6322	-0.2458	-0.0232	-0.0595

r/R x/c	0.50	0.60	0.70	0.75
0.10	0.8155	0.7908	0.7283	0.6821
0.15	0.6521	0.6436	0.6270	0.5797
0.30	0.3435	0.4027	0.3947	0.3889
0.40	0.2365	0.2902	0.2778	0.2806
0.50	0.1997	0.2335	0.2066	0.2200
0.70	0.0985	0.0666	0.0498	0.0808
0.80	0.0353	-0.0246	-0.0193	0.0125
0.90	-0.0319	-0.1257	-0.1197	-0.0904

COLL = 28
TORQUE = 55.45
PRESS = 14.698

RPM = 1800
CT/S = 0.2127
TEMP = 72.46

THRUST = 104.54
CQ/S = 0.0564
DENSITY = 0.002305

Cpu

r/R x/c	0.125	0.20	0.30	0.40
0.06	-4.0794	-2.8000	-3.5236	-3.4463
0.15	-7.0607	-3.7458	-2.9627	-2.5918
0.25	-7.6109	-3.7252	-2.6024	-2.1083
0.35	-6.8385	-3.1140	-2.1677	-1.6152
0.45	-4.2914	-2.1465	-1.5702	-1.1262
0.55	-3.0586	-1.5371	-1.0891	-0.7674
0.65	-2.6137	-1.0615	-0.7381	-0.5130
0.75	-2.5453	-0.8649	-0.5350	-0.3879
0.85	-2.5633	-0.5953	-0.3170	-0.3198
0.95	-2.3023	-0.3565	-0.1234	-0.2093

r/R x/c	0.50	0.60	0.70	0.75
0.06	-2.9980	-2.7558	-2.5479	-2.6468
0.15	-2.2919	-2.0800	-1.7735	-1.7073
0.25	-1.7810	-1.5651	-1.2388	-1.1747
0.35	-1.3217	-1.1356	-0.9622	-0.9431
0.45	-0.9267	-0.8127	-0.7913	-0.7936
0.55	-0.7081	-0.6671	-0.7099	-0.7024
0.65	-0.5190	-0.5675	-0.6255	-0.6311
0.75	-0.4173	-0.4953	-0.5681	-0.5857
0.85	-0.3303	-0.4855	-0.5514	-0.5597
0.95	-0.1774	-0.3459	-0.3792	-0.3931

Cpl

r/R x/c	0.125	0.20	0.30	0.40
0.10	-0.4921	0.3706	0.6391	0.7552
0.15	-1.2742	0.1039	0.4063	0.5570
0.30	-1.8136	-0.2845	0.1163	0.2804
0.40	-2.0279	-0.4584	0.0134	0.1874
0.50	-1.9296	-0.3915	0.0210	0.1520
0.70	-1.5965	-0.2754	-0.0085	0.0521
0.80	-1.6601	-0.2803	-0.0378	0.0023
0.90	-1.6211	-0.2208	-0.0301	-0.0565

r/R x/c	0.50	0.60	0.70	0.75
0.10	0.7921	0.7698	0.7293	0.6991
0.15	0.6357	0.6297	0.6222	0.5958
0.30	0.3315	0.3917	0.3962	0.3992
0.40	0.2266	0.2885	0.2812	0.2923
0.50	0.1941	0.2305	0.2138	0.2352
0.70	0.0952	0.0764	0.0681	0.0926
0.80	0.0265	-0.0075	0.0012	0.0355
0.90	-0.0414	-0.0978	-0.0883	-0.0765

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13. ABSTRACT (Maximum 200 words) A test of a small three-bladed model rotor, with geometry typical of that used on tilt-rotor aircraft, was conducted in the U.S. Army Aeroflightdynamics Directorate's anechoic hover chamber. The objectives of the test were to determine the hover performance of the rotor and investigate the pressure distributions on a blade operating at various collective pitch angles and tip speeds. This report presents the rotor performance data and blade surface pressures.				
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